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A. A. GRAY, Managing Editor.

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RATES FOR BOSTON STREET LAMPS.

In the recent Boston contract for electric street lighting the rate paid by the city per lamp is made up of a fixed annual cost and a running cost per hour of operation, as set out in that document.

Added interest attaches to this method of making rates because it also applies in more than a score of other cities and towns that are supplied by the Edison Company, in some of which the hours of operation for street lamps are less than one-half as great annually as they are in Boston.

The rates named in the Boston contract apply to forty, sixty and eighty-candlepower tungsten lamps, and to 425-watt alternating-current, to 500-watt direct-current, to 500-watt magnetite and to 500-watt General Electric flame arc lamps.

Each of these lamps operates 3,828 hours per year, and the total rate as computed is subject to a discount of five per cent because of the length of the contract.

The fixed yearly rate is $10.80 for the forty-candlepower, $12 for the sixty, and $14 for the eighty-candle tungsten lamp. On the 425-watt alternating-current arc lamp and on the 500-watt enclosed direct-current arc the fixed rate is $36 per year, while on both the magnetite and the General Electric flame arc it is $42 per year.

The running cost to the city per hour of operation is 0.25 cent for the forty-candle, 0.30 cent for the sixty-candle, and 0.40 cent for the eighty-candle tungsten lamp; also 1.5 cents for the alternating-current arc, 1.6 cents for the direct-current enclosed arc, 1.75 cents for the magnetite arc, and 3.2 cents for the flame arc.

For the 3,828 hours of operation the above fixed and running costs, less five per cent, amount to the following total annual rates per lamp: Forty-candlepower tungsten, $19.55; sixty-candlepower tungsten, $22.31; eighty-candlepower tungsten, $27.85; 425-watt alternating-current arc, $88.75; 500-watt enclosed direct-current arc, $92.39; 500-watt magnetite arc, $103.54; 500-watt General Electric flame arc, $156.27.

On the basis of 3,828 hours of operation per year, the fixed rate for the forty-candlepower tungsten is 0.28 cent and its total rate is 0.53 cent per lamp-hour. For the sixty-candlepower tungsten lamp the fixed rate is 0.31 cent and the total rate 0.61 cent per lamp-hour, while for the eighty-candlepower the fixed rate is 0.36 cent and the total 0.76 cent.

With the same number of hours, the 425-watt alternating-

current arc has a fixed rate of 0.94 cent and a total rate of 2.44 cents per hour of operation, the 500-watt enclosed direct-current arc has a fixed rate of 0.94 cent and a total rate of 2.54 cents per hour, the magnetite arc a fixed rate of 1.09 and a total rate of 2.84 cents per hour, and the flame arc a fixed rate of 1.09 and a total rate of 4.29 cents per hour.

A division of the total rate per lamp-hour in each case by the fraction of a kilowatt required to operate the lamp gives the following total rates in cents per kilowatt-hour: Forty-candlepower tungsten, 10.64 cents; sixty-candlepower tungsten, 7.66 cents; eighty-candlepower tungsten, 7.65 cents; 425-watt alternating-current arc, 5.74 cents; 500-watt direct-current arc, 5.08 cents; 500-watt magnetite, 5.69 cents; 500-watt flame arc, 8.59 cents.

With a small number of operating hours yearly, the fixed rates per lamp-hour and the total rates per kilowatt-hour, of course, increase, as the fixed annual rate in all cases remains the same.

Thus with only 1,600 hours of annual operation, the fixed rate per hour is 0.67 cent, and the rate per kilowatt-hour is 18.40 cents, for a forty-candle tungsten lamp, while the fixed rate is 0.75 cent and the rate per kilowatt-hour 13.12 cents, for a sixty-candle lamp.

On a 425-watt alternating-current arc lamp in use 1,600 hours annually, the fixed rate amounts to 2.25 cents per lamp-hour, and the rate per kilowatt-hour is 8.82 cents.

OUTPUT OF A HYDROELECTRIC PLANT.

Two variable factors affect the output of a hydroelectric plant, namely, the run of the river and the demand for electric power.

Only when this demand and the run of water correspond to the generator capacity can the station operate at full load.

Results on different streams vary with the local conditions, but a record of the output of one plant, together with the main factors of the situation, gives more or less indication of what can be done at others. Such a record is here presented for a hydroelectric plant that generated approximately one-half of the energy distributed by the electrical supply system in an important city, during a number of years. This hydroelectric plant and the steam-driven station and distributing system in the city are all owned in common, so that it is for the interest of the lighting company to use the waterpower as far as practicable.

A river of only moderate volume drives the wheels of this hydroelectric plant, its drainage area above the dam is about 570 square miles and contains 3,400 acres of storage surface in ponds and reservoirs, and this storage is regulated to some extent for the benefit of all the waterpower plants on the stream. The average rainfall over the drainage area of this river is about forty-five inches annually, with not less than ten inches in each of the four seasons.

At the hydroelectric plant in question the fall of this river at ordinary stages is twenty-three feet, and the flow is estimated at 290 cubic feet per second for the minimum and about 24,000 cubic feet for the maximum, that has occurred only once in half a century. The ordinary flow during ten months in the year is put at about 450 cubic feet per second, but the discharge rate is often greater than this figure.

The hydroelectric plant with an operating head of twenty-three feet was equipped with alternators of 1,500 kilowatts total capacity, and also with an equal capacity in transformers to step up the voltage for a transmission of about eleven miles. At the substation in the city where the energy from this plant was distributed another set of transformers reduced the voltage to about 2,300.

With a combined efficiency of seventy-one per cent for the waterwheels and electric generators in this plant, which is probably as much as could be expected on the average, 1,080 cubic feet of water per second is necessary for operation at the full load of 1,500 kilowatts. This requirement at full load of 1,080 cubic feet of water per second is 3.7 times the reported minimum flow of 290 cubic feet, and 2.4 times the ordinary flow of 450 cubic feet per second during ten months of the year.

If the efficiency of the step-up and step-down transformers and of the transmission line together be assumed at eighty-five per cent under full load, it would be possible to deliver 1,275 kilowatts in the form of 2,300-volt current at the substation, when the generators are delivering 1,500 kilowatts in the hydroelectric station.

The output of the hydroelectric plant in this case was measured on the 2,300-volt side of the transformer at the substation, so that the load factor may be computed on the possible delivery of energy at this substation with operation twenty-four hours per day at full load, if the above efficiency of transmission or some other be assumed.

During the first year of operation the run of the river was low and the total energy delivered at the substation from the 1,500-kilowatt hydroelectric plant amounted to an average load of 410 kilowatts for 8,760 hours. This average load amounts to 27.3 per cent of the 1,500 kilowatts capacity at the hydroelectric plant. In the following year more water came down stream, and the substation received 550 kilowatts on an average during the 8,760 hours, or 36.6 per cent of the generator capacity at the waterpower.

An average delivery of 756 kilowatts was made to the substation from the waterpower during the 8,760 hours of the following year, or 50.4 per cent of the capacity of the alternators. For the fourth year of operation the average power received at the substation over the transmission line amounted to 801 kilowatts on a twenty-four-hour basis, and this was 53.4 per cent of the rated generator capacity. During the fifth and last year here recorded the waterpower furnished an average of 769 kilowatts at the 2,300-volt switches in the substation, or 51.2 per cent of the capacity of the generators at the other end of the line.

For the five years together the average load on a twenty-

four-hour basis carried by the waterpower, as measured at the substation, was 657 kilowatts, with a variation of the average from 410 to 801 kilowatts in the different years. This average for the five years was 43.8 per cent of the generator capacity at the hydroelectric station.

As this generator capacity required 3.7 times the minimum run of the river for its operation at full load, the average delivery of 43.8 per cent of this capacity at the substation during every hour for five years is an excellent working result. This result was made possible by a large load factor for the electrical supply system that distributed the waterpower, and by the use of storage batteries.

In the second year of the period under consideration, the load factor of the electrical system was sixty-four per cent on a normal June day and forty-seven per cent on a normal December day, on a twenty-four-hour basis, as the result of a large motor load.

The storage battery had a capacity of about 900 kilowatts during five hours, and was used to transfer the unused waterpower to the time of maximum load.

GOING VALUE.

In a number of cases the courts and commissions have affirmed the existence of a "going value" in connection with public-service properties, beyond their mere cost of construction.

This question has come up only within the past score of years, and the first case to award a "going value" on a public-service property sold to a municipality appears to have been National Waterworks *vs.* Kansas City, 62 Federal Reporter, 853, decided in 1894. Here the city exercised its right under a statute to purchase a waterworks, and the commissioners appointed to value the property awarded a sum to the company based merely on the present structural cost of the plant. On appeal from this award by the commissioners, the court increased its amount by $286,000, and gave its reasons thus:

"It is obvious that the mere cost of purchasing the land, constructing the buildings, putting in the machinery, and laying the pipes in the streets—in other words, the cost of reproduction—does not give the value of the property as it is today. A completed system of waterworks, such as the company has, without a single connection between the pipes in the streets and the buildings of the city, would be a property of much less value than that system connected, as it is, with so many buildings, and earning, in consequence thereof, the money which it does earn."

Another case was Gloucester Water Company *vs.* Gloucester, 179 Mass., 365, decided in 1901, where the company exercised its right to sell its property to the city. Commissioners here added a sum for the fact that the plant was "a going concern" to its cost of reproduction, less depreciation, and said that this addition was "as much a part of the property valuation as any other part of it." In affirming this award the court said:

"It is plain that the real, commercial market value of the property of the water company is, or may be, in fact, greater than 'the cost of duplication, less depreciation,' of the different features of the physical plant."

The award of the commissioners for the value of the Holyoke gas and electric plants was made in 1902, and included an item for "going plant." In explanation of this added value for "going," the commissioners said:

"The company, therefore, will turn over to the city these plants, not only with a capacity to earn a profit, but having brought both into a prosperous and profit-paying condition. For this reason we think the value of the property has been enhanced in the market, and have allowed for the same in finding the fair market value."

Kennebec Water District *vs.* Waterville, 97 Maine 185, again presented the question whether an allowance for being a "going concern" should be added to the structural value of a public-service plant, and the court answered in the affirmative, saying:

"Of course, a plant, as such, already equipped for business, is worth more, if the business be a profitable one, than the mere cost of reproduction."

In a later Maine case, Brunswick Water District *vs.* Maine Water Company, 99 Maine, 371, where a company sold its waterworks to a municipality, the court thus stated the existence of going value, after discussing the structure of the plant:

"Nevertheless, it has value as a structure. But more than this, it is a structure in actual use, a use remunerative to some extent. It has customers. It is actually engaged in business. It is a going concern. The value of the structure is enhanced by the fact that it is being used in, and, in fact, is essential to, a going-concern business."

The above cases appear to show a general recognition by courts and commissions of a going value that results from the development of public-service business, and depends to some extent, at least, on the amount and profits of that business.

THE EQUIPMENT OF THE HOTEL LA SALLE.

The new Hotel La Salle, a description of the electrical and mechanical equipment of which may be found on other pages of this issue, has been constructed in record time, notwithstanding the fact that the builders have been inconvenienced by numerous labor difficulties. A great amount of attention has been centered on the building of this hotel for that reason as well as because its power plant is probably the largest and most complete isolated plant in Chicago. The conditions in a hotel of this size are peculiarly suited for an isolated power plant on account of the large amount of steam constantly required for heating and other purposes.

Individual motor drive has been used wherever practicable and some very interesting applications thereof have been made. The lighting fixtures, particularly in the various public rooms, are noteworthy because of the highly effective character of their design. However, it is singular that the management has not provided, to a greater extent, for the use of high-efficiency incandescent lamps for lighting this hotel.

POWER USED IN THE RE-MANUFACTURE OF LUMBER, WITH SPECIAL REFERENCE TO CENTRAL-STATION ENERGY FOR THAT PURPOSE.[1]

BY C. H. SICOTT.

PART I.

Data are readily available which would furnish material for a number of papers embodying academic and practical phases of the problems involved in applying electric motors to woodworking machinery, and the manifold advantages resultant from such application. However, when we attempt to anticipate reply to certain pointed questions which central-station managers might logically put up to us, for example, "To what extent has metered power for woodworking business been developed—is the field profitable—what are other central stations doing in this special line throughout the country, and how may I benefit by the results achieved elsewhere?" there is really too little of real working value at hand. Nevertheless, the exact needs of the situation are realized and immediate steps are being taken to collect and tabulate this data.

I have extracted from the United States Census reports for 1905 some statistics bearing upon the re-manufacture of lumber and the power used in that industry. As indicating the importance of the lumber and timber industry in the United States it may be stated that in 1905 these products ranked second in the number of establishments, fifth in capacity, third in the number of wage-earners, sixth in total cost of material and fourth in value of products. The total dollar value was $1,223,730,336 for 1905, an increase of twenty-one per cent over 1900, in which year the total dollar value amounted to $1,000,900,778.

The total horsepower used in Michigan during 1905 for all purposes is given as 468,449, of which 376,000 is credited to steam, 10,534 to gas, 39,342 to water, 27,559 to electric isolated plants generating their own electric power, 12,441 to central-station power.

The total horsepower in Michigan devoted to lumber re-manufacture was twenty-five per cent of the total for all purposes in that state; rented electric power being only 0.06 per cent of this total and but two-and-three-tenths per cent of the total central-station rented power.

[1] Abstract of a paper read before the sixth annual convention of the Michigan Electric Association at Detroit, August 18, 1909.

Present-day statistics would undoubtedly show a more favorable condition of affairs as regards the central-station proportion of the total of all or specified industrial power loads. Still, the writer believes that the situation is capable of much improvement from the central-station standpoint, even admitting that great strides have been made in securing industrial power customers during the last five years and also making due allowance for those woodworking plants where central-station power could not, save under very exceptional conditions, be made attractive, due to the availability of excessively large quantities of waste fuel produced in manufacturing.

SOLICITING POWER LOAD.

It is generally admitted, I think, that the broadest and most profitable field for the acquisition of power by central stations lies among industrial establishments. The size of the plant and the capital outlay usually represented by the same demand, require, however, a very careful analysis of present operating and fixed costs, in order that the prospective customer may be convinced that the central station in predicting results has, as far as possible, eliminated the element of chance and based its promise upon a logical and exact study of the factors at stake.

In soliciting power for woodworking, as well as other industrial establishments, a great proportion of success depends upon the aptitude on the part of the central-station power solicitor to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far to demonstrate definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout. A great deal of good power business has been lost due to the use of the "rule of thumb" or "hit and miss" methods which are as fatal to success in securing motor business as in any other line where specialized knowledge is the indispensable condition to a favorable issue. Much depends then on the solicitor, who should possess sufficient technical knowledege relating to design, construction and operation of electrical apparatus in general, and of motors in particular, besides having a good amount of practical training, so that he may understandingly approach on equal ground the managers, engineers, foremen, etc., of the lumber plants which he is called upon to visit. I also believe it a most excellent plan for the solicitor to familiarize himself, as far as possible, with the names, operation and functions of the different machines ordinarily used in the different classes of lumber re-manufacture, since a knowledge of the driven tool is essential, if the proper motor is to be adapted to same. In addition, the superintendent or owner is certain to be impressed favorably if the solicitor can converse understandingly regarding the re-manufacture of lumber and the machinery used for that purpose and will be apt to assume that such knowledge presupposes an equal facility in applying the proper electric drive.

The solicitor should tabulate for record all the essential data in connection with each installation made, since the value of the accumulated knowledge thus obtained and the ability to readily analyze and solve future power problems will in time prove invaluable additions to the central station's technical data and to the solicitor himself, who each year will thus profit by the experience gained, naturally becoming a better "business getter" and commanding a larger pecuniary return in proportion with his increased efficiency.

Central-station managers should make it obligatory that power men should make out and file for permanent record the data suggested. While I recognize that this is done among the greater proportion of the larger central stations, the practice often prevails of keeping information properly belonging to the employer, "under the hat" of the employe. A high-grade solicitor should make careful studies and accumulate working data concerning steam and internal-combustion isolated plants and should be able to promptly estimate the numerous items which make up fixed and variable charges. He should also know the water rates of different types of steam prime movers and pumps commercially used, the cost in that particular locality of coal, lubricants, water, supplies, etc., cost per horsepower installed for complete small plants and in general be prepared to rebut the arguments which may be brought forward in favor of isolated-plant service.

Admitting that the use of central-station energy by large industrial plants is one of the most difficult lines of power business to secure, the re-planning of each isolated-plant layout should receive the closest attention. The power engineer should, in company with his customer, or his engineer, first consider carefully if the existing grouping of machines is the best possible to secure the most conven-

ient handling and advantageous sequence of operation throughout the various processes of manufacture, effecting whatever transposals may be conducive to better light, greater cleanliness, more ample passageways, less danger to operators, the exclusion of all losses between the power source and the cutting edge of the tool, and in general taking advantage of every chance to effect the physical betterment of the shop and to increase its production. Notes should be made of the class of material handled, maker's name, the designated number of each machine, the average time it is on duty, the speed, diameter and face of its driven pulley, etc., all that each productive unit may be studied to determine both its individual requirements and proper co-relation with the rest of the machines making up the plant's equipment.

METHODS OF MACHINE DRIVING.

Let us for a moment consider some alternative methods of laying out the drive for a typical woodworking shop consisting of one or several buildings. There are several ways of applying electrical power, each varying in the amount of first cost, the advantages in operative economy, etc., being proportionate to the capital investment decided upon.

(1) The simplest and most elementary method would be to supply electric current to each building and operate the same by a single motor of sufficient capacity to run all the machinery installed. This would do away with the existing engine plant, but would permit little or no change in the arrangement of tools or shafting, or the abolition of mainshafts and countershafts. The importance of reducing to a minimum all unnecessary friction losses is apparent if we consider the yearly cost of power constantly used; for example, one horsepower 3,000 working hours per year at a four-cent rate is equivalent to $90 per year. The arrangement suggested is also defective in that all the driven machinery is dependent upon one unit, whose breakdown might occasion the complete stoppage of the plant.

(2) An improved modification of the first method, but applying group drive in each shop by a motor for separate departments or by connection to economical sections of the main, line of countershaftings. This method, however, like the first, might not permit any more favorable arrangement of tools than method number one.

(3) An entire re-arrangement of all the tools with reference to departments and locations, providing for the best sequence of work through the shop, installing such a combination of group or individual drives as would place those tools constantly used as far as possible in groups and providing individual drives for those machines which are more or less isolated and used intermittently.

(4) Provide an individual motor for each machine except in those particular cases where groups or machines may be so operated as to give a high load factor, or in those cases where the instantaneous demands for power may make it advisable to draw upon the "diversity factor" of a motor made to operate more than one machine and where maximum demands for power do not come upon all machines simultaneously.

The last method suggested offers so many advantages, both from an operating standpoint and as regards the cost of metered current, that in the majority of cases the additional capital outlay is justified to secure such advantages. A carefully prepared report would allow the solicitor a chance to demonstrate the successive advantages of the four methods outlined.

SIZE OF MOTORS.

The power required to drive woodworking machinery varies widely, according to the hardness and relative humidity of the wood used, the speed and depth of the cut, the physical condition of the knives, saw teeth, or other cutting tools. New and stiff machines, such as triple-drum sanders, may take considerable more power at first than after a few weeks' limbering up, and dull or wrongly adjusted knives may result in a drain of 200 to 300 per cent on the power source over what would be required if the machines were in the very best order.

Particular care should be taken in recommending motors for large planers, matchers, surfacers, band resaws, etc., where a wide variety may exist between the classes of lumber re-manufactured and the feed and speed used. With light machines, such as dado, variety and combination saws, jointers, tenoning machines, column and drum sanders, bench borers, etc., the general character of the work and margin of power usually allowed by manufacturers in specifying horsepower to drive minimize to some extent the danger of under-motoring.

The majority of woodworking establishments are devoted to certain classes of work—those using soft wood seldom use the harder variety. When they do have a small amount of hardwood to be re-manufactured, the overload capacity of a good motor is usually ample to take care of such occasional overstrain on the driving unit. It is well to remember that the power required by woodworking machines varies directly with the speed, so that the load is diminished by not forcing the material through the machine at so fast a rate. Therefore, hardwood, if machined at a slow feed, may not take more power than would be required by soft wood with the feed and cut run at maximum. Where machines are constantly to use very hard wood, such as lignum vitæ, the motors should be at least twice the ordinary horsepower employed for soft wood re-manufacture.

Again, the load on a woodworking machine is under most conditions of an intermittent character, and the driving motor may often be rated at its temporary overload capacity, since the rapidity of feed and the consequent quick completion of cut allows frequent intervals of rest before another piece of work can be fed in or made ready.

POWER REQUIRED TO DRIVE WOODWORKING TOOLS.

The power required to drive a given machine or machines may be obtained with exactitude or approximately estimated as follows:

Exact Methods.—(1) Guarantees from manufactures regarding the performance and power of a given machine with stated feed, cut and material.

(2) By the use of a temporarily installed motor with proper indicating or graphic-recording instrument to record the wattage input to the motor, and therefrom the power required by the working machine.

As a means of obtaining a continuous and exact record of the performance of a given machine or machines, the graphic or curve-drawing wattmeter is for many reasons usually preferable to instruments of the recording or indicating type. In brief, the graphic instrument possesses the following cardinal points of advantage in the test and analysis of electric-motor drive:

(A) As a means of immediately ascertaining whether the capacity of the driven machine is sustained at maximum, as well as showing the time wasted by operators prior and subsequent to "bell time" and in removing finished work to start new work; also as providing a test of the relative efficiency of both men and ma-

chines to perform a given operative function. (B) In determining the proper horsepower and type of winding best suited to the requirements of the driven machine. (C) In checking up the cause for alleged abnormal power bills as well as the physical condition of the driven machine and its cutting edges. (D) To correct error in shop operation and provide a means of determining the unit cost to be debited against power. To enable the central station to determine the power rate which a given customer should pay based upon his maximum demand for a given time limit.

I am particularly in favor of using curve-drawing instruments in preliminary tests made by the central station to prove in general the advantages and efficiency of electric drive, since the prospect can see with his own eyes an irrefutable and easily comprehended record of the machine's cycle of productive and non-productive operation. Non-technical customers, who may become easily confused if the explanation of tests is presented couched in even the simplest electrical terminology, can understand at a glance a graphical curve representing only factors of time and horsepower.

Approximate Estimates.—(1) The power to drive may be roughly calculated by observing the speed, diameter and width of the belt to the driven pulley of the machine. This method involves, however, a decided chance for error, since the pulleys are usually proportioned so that the driven machine may, if necessary, be belted for the maximum duty. However, for ordinary service, woodworkers estimate that a belt one inch wide will transmit one horsepower at 1,000 revolutions per minute, double belting one-and-one-half horsepower under the same conditions.

(2) When group drive by engine or a single motor is used, indicator cards on the former and meter readings on the latter may be taken on one or a number of driven machines doing actual work. By repeating the test "running light," that is, with belts on loose pulleys, the friction loss may be recorded and a subtraction of the result from the full-load reading will show approximately the useful energy expended by the machines themselves. This method, due to the intangible increase of friction with increase of load, and the introduction of other variables, is liable to error, and consequently incorrect deductions, especially where the friction load may be as great or greater than the useful load. Still the results may assist in predetermining the net power required, as well as often showing great waste in the existing transmission system.

To indicate the wide difference in power required to drive, let us take at random several cases of machines tested in a woodworking plant:

1st. A motor driving a twenty-four-inch buzz planer with a cut two-and-one-half inches wide by one-eighth inch deep took 2.1 horsepower and with a cut thirteen by five-sixteenths inch, 4.5 horsepower.

2d. A motor driving a twenty-four-inch cylinder planer with a cut six inches wide by three-sixteenths inch deep (in dry spruce) took 4.1 horsepower and with a cut double the width and only one-third inch in depth (but with the same wood wet) required eighteen horsepower.

3d. A ten-inch circular saw with one-half-inch cut and easy feed took 2.7 horsepower and in two-and-one-half-inch hardwood required eight horsepower.

4th. A fifteen-inch tandem scraper (in rock maple) with one knife cutting material six-and-three-fourths inches wide with shaving 0.0035 inch in thickness required 3.25 horsepower; with two knives cutting, material thirteen-and-one-half inches wide and 0.009 thick, nine horsepower.

5th. A forty-two-inch single scraper (in rock maple) with feed eighty-two feet per minute, width of material twenty-nine inches, thickness of shaving 0.004 took 5.5 horsepower; with the same width of material and double the thickness of shaving, 9.5 horsepower.

6th. A thirty-inch single surfacer (in soft pine) with feed of thirty-four feet per minute, cutters running at 4,200 revolutions per minute, material ten inches wide, one-sixteenth inch cut, required 4.5 horsepower. With the width of material increased to twenty-nine inches and the depth of cut to one-half inch, 36.5 horsepower was required.

7th. A thirty-inch double surfacer (in soft pine) with feed of thirty-four feet per minute and cutters running at 3,800 revolutions per minute, required with cut eight inches wide and one-fourth inch at the top and one-eighth inch at the bottom, 11.5 horsepower. With feed of sixty feet per minute, cutters running at 4,200 revolutions per minute, width of material twenty-nine inches, depth of cut at top three-sixteenths inch and at bottom one-sixteenth inch, required thirty-eight horsepower.

All the above shows the necessity of studying the requirements of each machine. We find cases where data are taken from pattern shops and wrongly applied to other shops where the machinery is employed to remove heavy cuts on hardwood. In such cases machines may require double or triple the capacity of the pattern shop.

[To be continued.]

Coney Island & Brooklyn Railroad Company.

A further hearing was held August 25 on the complaint of Jonas Monheimer, against the Coney Island & Brooklyn Railroad Company for a reduction of fare to Coney Island on week days to five cents, instead of the ten-cent fare now charged. This is the second complaint of Mr. Monheimer; the first included Saturdays, Sundays and holidays, but Commissioner Bassett stated that he thought the companies justified in charging ten cents on these days, and a new complaint would have to be filed regarding week-day fares.

Commissioner Bassett called upon Henry Floy, acting chief of the commission's appraisal bureau, who testified that a complete appraisal had been made of the property of the Coney Island & Brooklyn road, and filed with the commission the following figures as being the tangible value of that line up to February 1, 1909:

Track	$ 729.852
Track special work	241.582
Paving	421.474
Overhead trolley construction	145.965
Overhead feeders	110.632
Underground conduits and cables	336 324
Power plants and substations	733.393
Buildings	579.983
Rolling stock	1,383.461
Total	$4,682,970
Add incidentals:	
Organization, engineering, etc.	$ 702,445
Total	$5,385.416
Miscellaneous stock, fixtures, etc.	103.679
Real estate (assessed value)	187.800
Grand total	$5,676,895

Attorney Kuhn, representing the railroad company, asked for an adjournment of one month for his company to verify the figures submitted, claiming that this was reasonable when it was taken into consideration that it took the commission one year with forty men on the job. Commissioner Bassett denied the motion and allowed the company two weeks, saying that they should be familiar with its own property.

The hearing was finally adjourned to September 8. The commissioner stated that on that date he would expect everything to be completed and announced that the case would probably be dismissed then.

A New Electrical Institution.

At a meeting of representative electrical engineers of South Africa, held at the Grand National Hotel, Johannesburg, South Africa, on July 12 last, a new electrical institution was founded with the name and title of the "South African Institute of Electrical Engineers." Draft rules were approved and a provisional council elected.

Production of Coal in 1908.

The total production of coal in the United States in 1908, as reported by E. W. Parker, of the United States Geological Survey, was 415,842,698 short tons, having a spot value of $532,314,117. Of this total 74,347,102 long tons (equivalent to 83,268,754 short tons), with a spot value of $158,178,849, was Pennsylvania anthracite and 332,573,944 short tons, with a spot value of $374,135,262, was bituminous and lignite.

The following table shows the output of 1908 compared with that of 1907:

PRODUCTION AND VALUE OF COAL IN 1907 AND 1908, BY STATES AND TERRITORIES, WITH INCREASE OR DECREASE IN 1908.

State or Territory.	Production (short tons). 1907.	1908.	Increase (+) or decrease (—), 1908.	Value. 1907.	1908.	Increase (+) or decrease (—), 1908.
Alabama	14,250,454	11,604,593	— 2,645,861	$18,405,468	$14,647,891	—$3,757,577
Arkansas	2,670,438	2,078,357	— 592,081	4,473,693	3,499,470	— 974,223
California and Alaska	24,089	21,862	— 2,227	91,813	69,650	— 22,163
Colorado	10,790,236	9,634,973	— 1,155,263	15,079,449	13,586,988	— 1,492,461
Georgia	362,401	264,822	— 97,579	499,686	364,279	— 135,407
Idaho	*7,588	5,429	— 2,159	*31,119	21,832	— 9,287
Illinois	51,317,146	47,659,690	— 3,657,456	54,687,382	49,978,247	— 4,709,135
Indiana	13,985,713	12,314,890	— 1,670,823	15,114,300	13,084,297	— 2,030,003
Iowa	7,574,322	7,161,310	— 413,012	12,258,012	11,706,402	— 551,610
Kansas	7,322,449	6,245,508	— 1,076,941	11,159,698	9,292,222	— 1,867,476
Kentucky	10,753,124	10,246,553	— 506,571	11,405,038	10,317,162	— 1,087,876
Maryland	5,532,628	4,377,093	— 1,155,535	6,623,697	5,116,753	— 1,506,944
Massachusetts	.....	50	+ 50	.....	150	+ 150
Michigan	2,035,858	1,835,019	— 200,839	3,660,333	3,322,904	— 37,929
Missouri	3,997,936	3,317,315	— 680,621	6,540,709	5,444,907	— 1,095,802
Montana	2,016,857	1,920,190	— 96,667	3,907,082	3,771,248	— 135,834
New Mexico	2,628,959	2,467,937	— 161,022	3,832,128	3,368,753	— 463,375
North Dakota	347,760	320,742	— 27,018	560,199	522,116	— 38,083
Ohio	32,142,419	26,270,639	— 5,871,780	35,324,746	27,897,704	— 7,427,042
Oklahoma	3,642,658	2,948,116	— 694,542	7,433,914	5,976,504	— 1,457,410
Oregon	70,981	86,259	+ 15,278	166,304	236,021	+ 69,717
Pennsylvania	150,143,177	117,179,527	—32,963,650	155,664,026	118,816,303	—36,847,723
Tennessee	6,810,243	6,199,171	— 611,072	8,490,334	7,118,499	— 1,371,835
Texas	1,648,069	1,895,377	+ 247,308	2,778,811	3,419,481	+ 640,670
Utah	1,947,607	1,846,792	— 100,815	2,959,769	3,119,338	+ 159,569
Virginia	4,710,895	4,259,042	— 451,853	4,807,533	3,868,524	— 939,009
Washington	3,680,532	3,024,943	— 655,589	7,679,801	6,690,412	— 989,389
West Virginia	48,091,583	41,897,843	— 6,193,740	47,846,630	40,009,054	— 7,837,576
Wyoming	6,252,990	5,489,902	— 763,088	9,732,668	8,868,157	— 864,511
Total bituminous	394,759,112	332,573,944	—62,185,168	$451,214,842	$374,135,268	—$77,079,574
Pennsylvania anthracite	85,604,312	83,268,754	— 2,335,558	163,584,056	158,178,849	— 5,405,207
Grand total	480,363,424	415,842,698	—64,520,726	$614,798,898	$532,314,117	—$82,484,781

*Includes production of Nebraska and Nevada.

The total quantity of bituminous coal mined by machines in 1908 amounted to 123,183,334 short tons. The total production of coal in the states where machines were employed was 328,270,373 short tons, so that the machine-mined product was equivalent to 37.5 per cent of the total output of these states. The machine production in 1908 was less than in 1907, but there has been a steady increase in the percentage that the machine-mined coal bears to the total output of the states where mining machines have been installed, and also in the number of machines in use. The number of mining machines employed was 6,658 in 1903, 7,663 in 1904, 9,184 in 1905, 10,212 in 1906, 11,144 in 1907, and 11,569 in 1908. The percentages of machine-mined production in these years have been, respectively, 28.18, 28.8, 33.67, 35.1, 35.71, and 37.5. The average production for each machine in use in 1908 was 10,648 short tons, against 12,381 tons in 1907, 11,638 tons in 1906, and 11,258 tons in 1905, the lower average in 1908 being due to the smaller number of days the mines were worked and the decrease in total tonnage. Of the machines in use in 1908, 6,380 were of the pick or puncher type, 4,992 were chain-breast machines, and 197 were long-wall machines. Thees include twenty-six pick and 238 chain shearing machines.

Pennsylvania, the leading state in the total production of bituminous coal, leads also in the number of machines employed and in the total machine-mined production, 5,103 machines being employed in 1908 with a production of 52,447,809 short tons, or 44.76 per cent of the state's total. Ohio leads in the percentage of coal mined by machines, and has for several years been second in the total quantity of machine-mined coal, although West Virginia in both 1907 and 1908 had more machines in use than did Ohio. In 1908 there were 1,343 machines employed in the coal mines of Ohio, and the machine-mined product amounted to 19,799,140 short tons, or 75.37 per cent of the total. West Virginia employed 1,574 machines, by which 16,653,174 snort tons, or 39.75 per cent of the total, was mined. Illinois employed 1,217 machines and produced 15,045,004 short tons of machine-mined coal, or 31.57 per cent of the total. Kentucky, which stands seventh in the rank of coal-producing states, was second in the percentage and machine-mined coal to the total in 1908, over half of the total output of the state being machine-mined.

A movement is under foot in Germany to utilize the flow due to the tides in a branch of the Elbe River to generate electric power.

Telephone Openings in the West Indies.

An American minister in the West Indies forwards particulars and a copy of the law relative to a long-distance telephone concession that will be granted by the state. A copy of the report and of the law may be had by interested firms upon application (file No. 3794) to the Bureau of Manufactures, Washington, D. C.

In a recent report of an American consul in Latin America, information is given regarding a telephone concession lately granted in that district. The line is to have a length of 125 miles, which does not include a branch system that is projected. The name and address of the concessionaire can be furnished on application to file No. 3786, Bureau of Manufactures, Washington, D. C.

Telegraphers in Convention.

A joint convention of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps opened in the Fort Pitt Hotel, Pittsburg, Pa., on August 17. The meeting proved very enjoyable and instructive and many reunions of old friends occurred.

Both organizations are national in scope, and many men of prominence who have risen from the keys were in attendance on the three days of the convention. Thomas A. Edison is perhaps the most famous living telegrapher. A noticeable incident was the bitter denunciation of various administrations since the close of the Civil War, which have refused to consider their claim for pensions, made at the opening session of the Society of United States Military Telegraph Corps' convention. On Wednesday, August 18, the members were the guests of J. B. Yohe, general manager of the Pittsburg & Lake Erie Railroad, and were taken on a special train to Monessen, where an inspection was made of the plant of the Pittsburg Steel Company.

Approve Bridge Stock Sale.

Without passing upon the reasonableness of the price of $300 a share, which the New York Metropolitan receivers offered to pay the New York City Railway Company for 500 shares of the Bridge Operating Company, of which the par value is $100 a share, the Public Service Commission has granted its approval of the proposed transfer of the Bridge Operating stock from the New York City receiver to the Metropolitan receivers.

The Electrical and Mechanical Installation in the Hotel La Salle.

One of the Most Complete Equipments in Private Service—Chicago's Newest and Largest Hotel.

BY HOWARD EHRLICH.

Although statistics show that for the past few years Chicago has led the country in building operations, the city has long felt the need of hotels in keeping with its progress. In view of this need it is fitting that there should be erected here one of the largest hotels ever built under an original contract, a hotel the construction of which will be considered one of the great engineering feats of the day. A consideration of the electrical and mechanical features of this hotel will prove of more than passing interest.

The Hotel La Salle, which will be formally opened for public inspection next week, is located on the northwest corner of La Salle and Madison streets, in the center of Chicago's business district. It covers a space of 162.5 feet by 178 feet, is twenty-four stories in height, twenty-two above the street level and two below, and contains 1,172 rooms in all. This hotel is one of the most perfect examples of modern steel-frame fireproof construction, and in thus embodying convenience, quality and beauty the owners have achieved a distinctive and peculiar degree of success.

POWER PLANT.

Owing to the high value of the land upon which the hotel is erected, the design of the power plant and the selection of its equipment, necessitated an extended study as to the conditions and the requirements to be met with.

The power plant is located in the sub-basement. A general plan view is shown herewith. No effort was spared in making it a model of its kind. It is built on the broad and up-to-date lines, which are characteristic of the construction of the entire hotel.

BOILER ROOM.

For convenience in obtaining coal, the boiler room is located in the north end of the plant, adjacent to the alley. As is shown in the plan, six coal chutes are provided, along the alley, which connect with the coal bunkers in front of the boilers. Coal coming to the hotel in wagons, will enter the alley from the La Salle Street side, and be thrown into any of the chutes. Coal can also be brought to the hotel through the Illinois Tunnel system, this method being the more preferable. A tunnel connection is provided at the northwest corner of the boiler room, which is equipped with suitable conveying machinery. An elevator will convey the coal from the tunnel cars to the top of the bunker, where it will be discharged into a screw conveyor and be distributed. The conveyor is operated by a seven-and-one-half-horsepower Crocker-Wheeler motor. Each boiler has a chute of its own, conveying coal from the bunker to the stoker hopper.

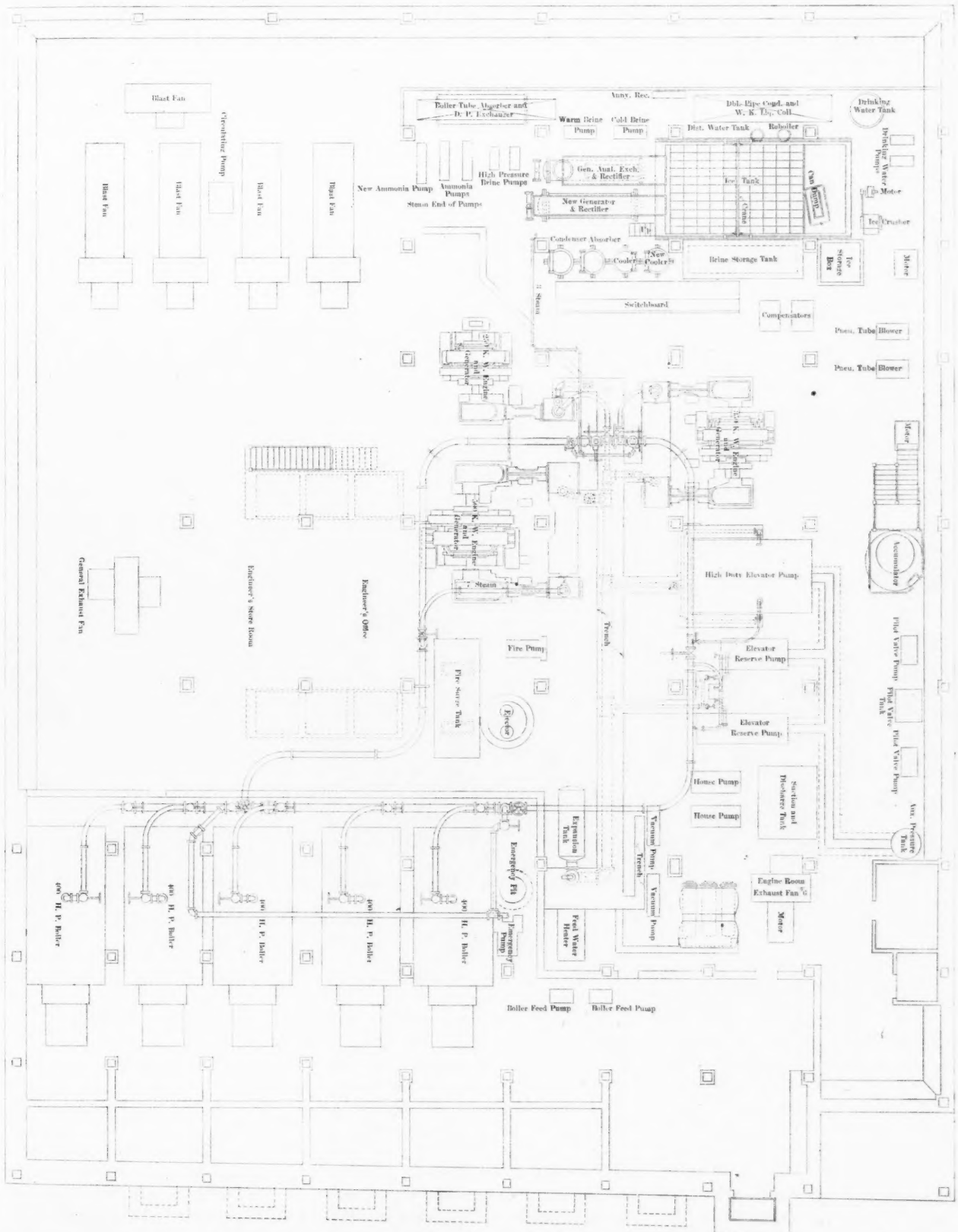
HOTEL LA SALLE, CHICAGO.

The steam is supplied by five 400-horsepower Lyons boilers, of the combination fire and water-tube type, in single settings, located in a row directly back of the coal bunker. They are of an unusually large type of boiler and are capable of an overload of fifty per cent. The pressure carried is 160 pounds. The boiler consists of the usual shell and tubes, but has in addition one row of tubes beneath the shell connecting the water saddles at each end. This lower row of tubes is covered by a special fire tile and is used as an arch for the furnace.

The furnaces are equipped with McKenzie improved chain-grate stokers. A feature worthy of note in this installation is that each stoker is independently

driven by a two-and-one-half-horsepower, 220-volt, Crocker-Wheeler motor, thus doing away with the danger of having all the stokers out of commission on account of an accident to any one. A spare motor is provided for use in case of an emergency. Each motor is controlled by a Cutler-Hammer starting box.

The tops of the ash pits are arched over so that the fine coal which sifts through the grates will not be wasted, but is thrown back into the stoker hoppers. Ashes are at intervals discharged from the dump grate into a steel car on tracks in the ash pit, which extend from the



GENERAL PLAN OF POWER PLANT, HOTEL LA SALLE.

bridge wall to about four feet in front of the stokers. The ashes are hoisted from these cars into wheelbarrows and dumped into a chute leading to Illinois Tunnel cars.

Just west of the boilers and located side by side are two twelve by eight by twelve-inch vertical, duplex pumps, built by the Platt Iron Works, for feeding the boilers. These are the only pumps in the boiler room with the exception of the emergency pump, which is used in case of floods or bursting water mains and is located between the boilers and feed-water pumps.

PIPING.

The steam piping presents some novel features in mechanical engineering. The fourteen-inch main steam header is divided into three sections with auxiliary connections to the engine-room header, so that the boilers may be cut into three units, if necessary, for the purpose of making repairs on the engine-room header.

The engine-room piping is taken care of by a ten-inch loop, which is so connected that either half section of the header can be cut out and the operation of the hotel not interfered with. With the exception of three improved Jenkins gate valves on both main boiler header and engine-room loop, all valves in high-pressure piping are the Jenkins copper disk globe valves.

The exhaust piping from all the engines and auxiliaries is connected to a common expansion tank, which supplies the heating system, a Cookson open feed-water heater and three service heaters. The service heaters are used for heating water used in the kitchens and the house water.

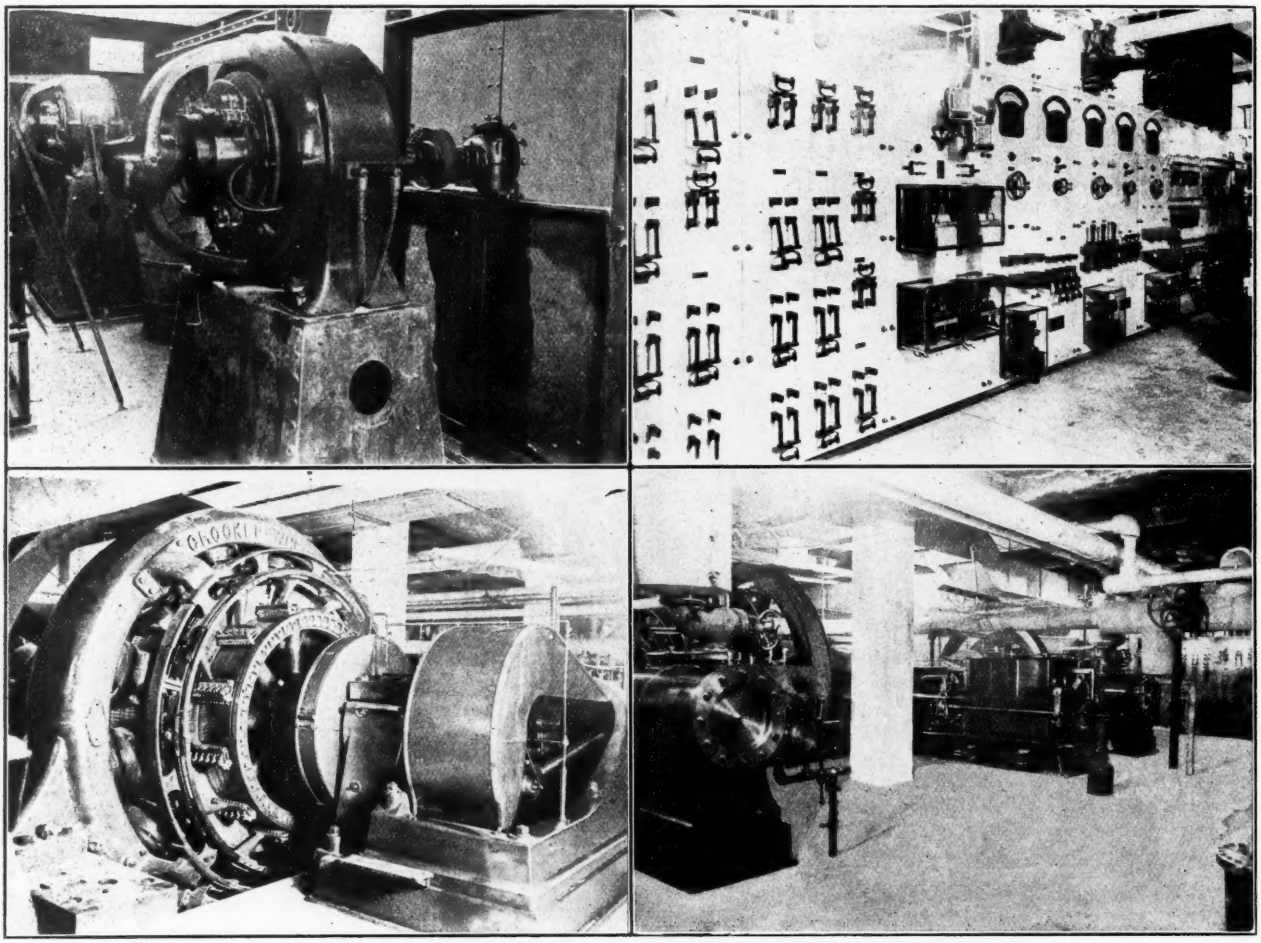
ENGINE ROOM.

The engine room is on a higher level than the boiler room and occupies the remaining area of the sub-basement.

There are three Fitchburg, four-valve, improved engines of the cam-valve-motion type, direct-connected to Crocker-Wheeler engine-type generators. The smallest engine of the three is a simple engine, running at 150 revolutions per minute and operates a 250-kilowatt generator. The two larger engines are of the cross-compound type. The smaller of these is direct-connected to a 350-kilowatt generator and the larger to a 500-kilowatt generator. The generators are 250-volt, compound-wound, direct-current machines and are guaranteed for a fifty per cent overload for two hours and a twenty-five per cent overload continuously. In addition to the generators there are two Crocker-Wheeler 125v/125v balancing sets for the three-wire lighting system, located directly west of the switchboard. One set is of the capacity of 250 amperes unbalance in neutral and the other set with a capacity of 350 amperes unbalance in neutral.

The normal lighting and power load is about 500 kilowatts and the complete connected load will be about 800 kilowatts. As the rated generator capacity is 1,100 kilowatts, an extra 300-kilowatt load is provided for.

In the southwest corner of the engine



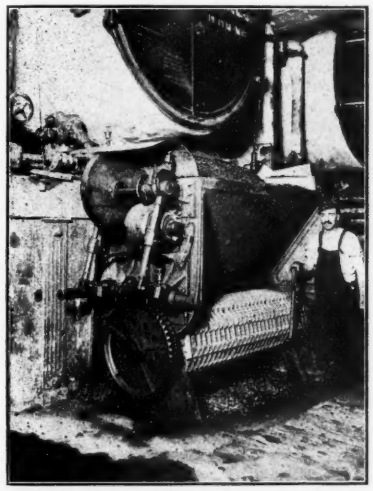
Motors Driving Ventilating Fans.
500-Kilowatt Generator.

Main Switchboard.
350 and 250-Kilowatt Generating Units.

VIEWS IN ENGINE ROOM, HOTEL LA SALLE.

room and directly back of the switchboard is installed a complete refrigerating plant, consisting of two Carbondale absorption machines, a brine cooler, and a storage tank with a capacity of 1,000 gallons. The larger of the two absorption machines is a fifty-ton machine and will be used for the manufacture of ice for cooling drinking water and for the cooling of the various refrigerators and ice-boxes. The smaller is a forty-ton machine and will be used for cooling air for various rooms. A motor-driven ice crusher is also provided for crushing ice for kitchen and buffet purposes.

In about the center of the engine room and near the west wall are located the elevator pumps for operating the nine Otis hydraulic elevators provided for this hotel. These elevators are of the inverted ram type and are equipped with electric annunciators and flashlight signals. The main fire pump is located adjacent to the 500-kilowatt generator.



VIEW IN BOILER ROOM, HOTEL LA SALLE.

SWITCHBOARD.

The switchboard in this hotel is a model of its kind. It is of the self-supporting angle-iron frame type and was made by the Western Electric Company. The board is thirty feet long and consists of eleven panels of white Italian marble about two inches thick. There are two power panels, one totalizing panel, three generator, two compensator and three lighting panels. The totalizing panel is equipped with a Weston voltmeter, a Westinghouse graphic-recording ammeter and a similar voltmeter for the 220-volt power system and a Weston voltmeter and two Westinghouse graphic-recording ammeters for the 110-volt lighting system. The generator panels consist of Weston ammeters, Thompson recording wattmeters and Cutter "I T E" circuit-breakers. Each generator panel is equipped with a pilot lamp, which is lighted when the machine is in operation. The two compensator panels are equipped with Weston ammeters. There are thirty-six lighting circuits controlled by the lighting panels and the power panels control eighteen power circuits.

The wiring of the board presents some novel features in switchboard wiring, probably the most notable being the simplifying of the busbar connections. The fuses, which are located on two small panels behind the main board, are connected to corresponding switches on the switchboard by threaded copper studs. The studs are terminated on slate terminal plates, located on top of the board directly over corresponding lugs. This does away with the threading of wire of busbars from the top of the board to lugs on switches, by extending bars to the panel at the top of the board. The generator leads run in iron conduits, underground, to the switchboard.

The mains from the switchboard are carried through one-and-one-quarter-inch iron conduits to the first basement, where they are distributed to the corners of the building and carried up four separate shafts, each shaft containing about four feeder circuits. There are over 1,500 separate circuits to be fed from these four shafts. All of the wire used in this hotel is Habirshaw red core wire.

VENTILATING SYSTEM.

In a single building which will be constantly occupied by from 500 to 1,500 persons, the ventilating system is of great importance. In the Hotel La Salle this system is complete in all of its details. The various rooms will be equipped for an entire change of air at certain intervals, while certain public rooms will be supplied with artificially cooled air.

The ventilating equipment inclues nineteen large, motor-driven fans, located on the twenty-first floor and in the sub-basement. Fresh air enters the air stack and is conveyed to the blast fans in the sub-basement, which are located in the southeast corner of the engine room, and from there supplied to the different rooms. These blast fans are equipped with Acme air washers. For furnishing the spray water the washers are equipped with pumps operated by five-horsepower C & C motors. The fans on the twenty-first floor are exhaust fans. All the fans are operated by C & C 220-volt motors, ranging in size from ten to twenty-five horsepower.

PNEUMATIC-TUBE SYSTEM.

For the transmission of orders, letters, etc., a pneumatic-tube system of the vacuum type has been installed. This system is particularly adapted for conveying orders from the various dining rooms to the main kitchen and will insure prompt and accurate service. For its operation two No. 4 Connersville blowers and two General Electric fifteen-horsepower, variable-speed motors are used, located just west of the switchboard. The speed of the motors is automatically controlled, so that power is consumed only while the carriers are being transmitted. For automatically controlling the motors and blowers and for regulating their speed a special panel is provided.

KITCHEN.

The kitchen of the Hotel La Salle embodies all modern conveniences known and contains such appliances as electrically operated potato peelers, meat grinders, coffee grinders, silver-polishing machines and ice-cream machines, also a system of electric dumb-waiters.

The dumb-waiters, installed by the Burdett-Rowntree Manufacturing Company, are of the most advanced type. The hoisting machinery is of the direct-connected, worm-gear drum type, with the drum and motor mounted on the same bed plate. These dumb-waiters are provided with limit stops, so that they will stop automatically at the top and bottom landings. They are controlled from a special panel in the kitchen.

GUEST ROOMS.

All of the guest rooms are provided with local and long-distance telephones. The 1,200 lines run through iron conduits and terminate in a six-position, lamp-signal, Western Electric switchboard. A majority of the rooms have connecting private bathrooms, which in every instance are equipped with electric curling-iron attachments. Every room is provided with door switches for automatically controlling the lights in the closets.

LIGHTING.

For lighting this hotel about 16,000 Westinghouse lamps are used. There are a large number of special size and special candlepower lamps provided for use in various large fixtures. The lamps in some of the larger rooms are controlled by special panel boards which control part of the lamps on each outlet.

In attaining electric lamp fixtures of

highly artistic worth, the manufacturers, W. T. Wilmarth Company, of Chicago, have also given due consideration to the mechanical problems to be met with, and the result is that the fixtures throughout the building represent the highest type of workmanship, and do much toward creating a harmonious feeling from the basement to the top floor.

FLOOR STANDARD AND ELECTROLIER IN BANQUET HALL, HOTEL LA SALLE.

As the hotel is of the Louis XIV design, all of the lighting fixtures in the public rooms, with but few exceptions, are of that design

ELECTROLIER IN MAIN DINING ROOM, HOTEL LA SALLE.

All of the larger fixtures are made of a special composition and are finished to match the decorations of the rooms in which they are used. An effort has been made to digress from the conventional dome type of fixture, and nearly all are of the pendant chandelier type.

In the main banquet hall several forms of fixtures are used. Along the walls are bracket lanterns with artistic trimmings. The main chandeliers, suspended from the ceiling by ornamental chains, are of very elaborate design and are trimmed with crystal. These fixtures are so designed that the crystal elaboration can be removed without in any way detracting from the general design. This arrangement is for summer and winter use, to give either a cool or warm effect to the room. In addition, there are provided a number of floor standards which add to the artistic beauty. All are finished in gold-leaf to harmonize with the gold decorations. Views of these fixtures are shown herewith.

On the same floor with the main banquet room is one of smaller size. The fixtures in this room are also finished in gold-leaf and are hung with silk cords and tassels.

In the main dining room are unique brackets with a vase attachment on top arranged to hold cut flowers. These brackets and also the chandeliers in this room are finished in gold.

The brackets in the dining room on the mezzanine floor are of gold basketwork design and are decorated with fruit and flowers.

Fixtures of Italian design are used throughout the palm room, located on the main floor. They are all finished in the dull shades of purple and yellow and are also decorated with fruit and flowers. Italian lanterns are suspended from the ceiling and along the walls are brackets of the same design and finish. A view of these lanterns is shown in the accompanying illustration.

A German restaurant, located in the basement, contains fixtures of wrought-iron material and of odd design and finish.

Around the exterior of the building, about eight feet above the street level, there are installed fourteen lanterns arranged for direct-current, enclosed arc lamps. The lanterns are of antique copper finish and harmonize with other exterior trimmings. They are suspended by ornamental chains.

LAUNDRY.

On the twenty-first floor is located a laundry, complete in all of its equipment. The machines, all of which are driven by individual motors, include eight washing machines, four extractors, two mangles, a clothes tumbler and other incidental machinery necessary in a laundry of this size. For operating these machines Crocker-Wheeler motors are used, ranging in size from one-half to ten horsepower.

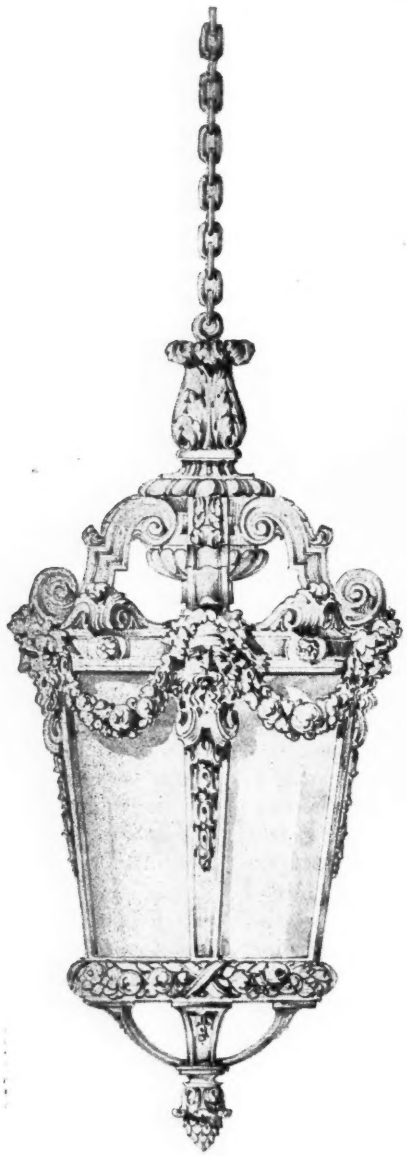
BANQUET HALL.

In designing the banquet hall, located on the nineteenth floor, the engineers considered and provided for all facilities in-

cidental to convenience and entertainment. A stage is provided for, which is complete in its electrical equipment. All necessary wiring for foot-lights, border-lights, spot-lights and a stereopticon machine is included.

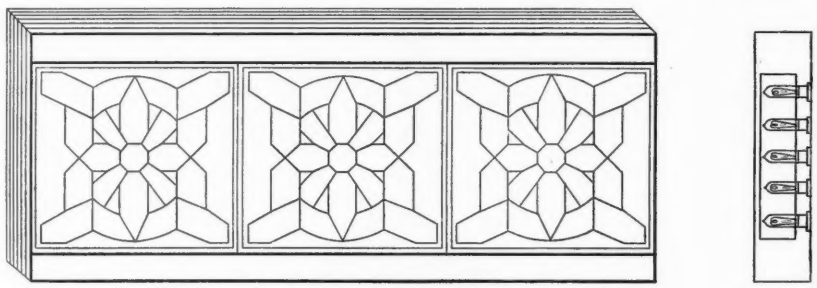
ELECTRIC CALL SIGN.

In the construction of the Hotel La Salle many striking features in electrical



ONE OF THE ITALIAN LANTERNS IN THE PALM ROOM, HOTEL LA SALLE.

devices have been incorporated by the architects, and among these is the silent system for calling carriages and automobiles. The calling will be done by electric signals installed by the Chase Electric Company. On the north and south ends of the marquise in the ornamental ironwork, there will be a nest of specially arranged receptacles, concealed by a leaded-glass face, as shown in an accompanying diagram. Controlling wires will run into the lobby of the hotel to a typewriter-like switchboard with numbered keys. To operate the call, the keys on the switchboard are pressed and corresponding numerals will flash on both signs.



ELECTRIC CARRIAGE CALL, HOTEL LA SALLE.

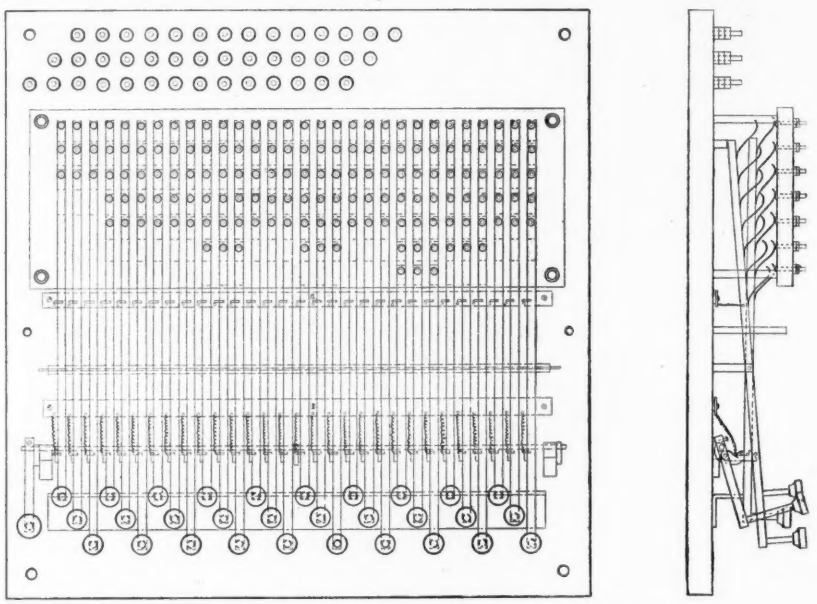
By pressing a key to the left of the keyboard, the contacts are released and the numerals disappear.

REVOLVING DOORS.

Another unique feature in the equipment of this hotel is the equipment of electrically operated revolving doors for the two main entrances. The revolving wings for both main entrances are constructed of bronze and are of the collapsible panic-proof type. They will be furnished with a 220-volt motor outfit placed over the tops of the doors in such a manner that the revolving wings may be folded and removed to one side of the opening. The electrical outfit can be arranged in such a manner that an attendant at the door can, at will, by the pressure of a push-button, start or stop the door. The motor used is a one-quarter-horsepower, shunt-wound Roth motor. It drives through a five-eighths round twisted endless belt running from the grooved motor pulley over two idler pulleys, which changes the horizontal-shaft drive to a vertical drive. The driven pulley is geared to a spur gear on the door to revolve it at a maximum of seven revolutions per minute. A speed regulator is provided for reducing the speed if required. By lifting the center gears out of mesh with its driver, the door is allowed to operate perfectly free.

From the foregoing brief account it will be seen that every improvement known to both the electrical and mechanical industries has been embodied in the Hotel La Salle, in an effort to make it one that will long hold a position of prominence as an example of perfection in hotel construction.

The architects of this hotel were Holabird & Roche. The Geo. A. Fuller Company were the builders, and the Arthur Frantzen Company, the electrical contractors. The writer is indebted to the various firms mentioned for much of the information herein contained.

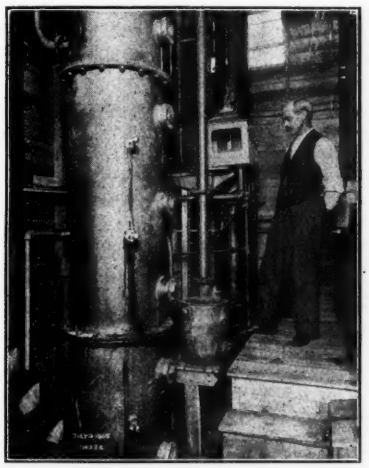


KEYBOARD OF ELECTRIC CARRIAGE CALL, HOTEL LA SALLE.

ETHYL ALCOHOL FROM WOOD WASTE.

BY GEORGE W. CRAVENS.

The old saying, to the effect that there is nothing new under the sun, has been proven wrong once more. This has happened so frequently during the last few years that it seldom excites comment to learn of something new. But when a discovery or invention which would cause radical changes in any art is made, then it is worthy of special emphasis. To claim that any development would cause a "revolution" in several lines of business is generally put down as being too broad a statement, but when the Department of



STILL AND RECTIFIER IN CHARGE OF U. S. GOVERNMENT GAUGER.

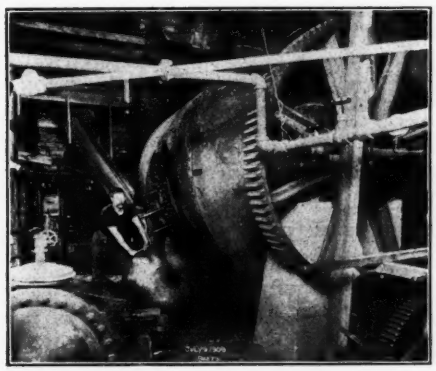
Agriculture of the United States brands an invention as "A Revolutionary Discovery" it is time to sit up and take notice.

Patents for making alcohol from sawdust and lumber waste have recently been granted to Malcolm F. Ewen and George H. Tomlinson, of Chicago. These patents were granted not because of certain claims based on theoretical considerations, nor because the discovery was accidental, but as the result of a great many years' experimenting and an expenditure of a large sum of money. In fact, a complete alcohol manufacturing plant is in operation at Chicago Heights, Ill., which represents an expenditure of $70,000.

For over half a century chemists all over the world have been seeking a practical method of manufacturing alcohol from the enormous amounts of wood scrap which annually goes to waste in the form of sawdust, shavings, slabs, etc.

In 1893, the president of the International Congress of Chemists, at the World's Fair, Chicago, declared: "The next great discovery in chemistry will be the manufacture of alcohol from lumber refuse." This great discovery has been made, and, what is more, the alcohol manufactured under the new process is purer than grain alcohol and can be manufactured at approximately one-fifth the cost.

The importance of this discovery is so great that it is impossible of comprehension without considerable thought. By putting a low-priced fuel of high calorific value in the field there springs up a new competitor of coal, wood, gasoline and kerosene, as well as of both grain and denatured alcohol. Alcohol manufactured under the Ewen-Tomlinson process costs but seven cents per gallon. It is 190 degrees proof, and when denatured should be the cheapest liquid fuel on the market. It might be made a serious competitor of gasoline for automobile purposes, and plans are already under way to enter this market.



CONVERTER IN SUGAR HOUSE BEING EMPTIED.

This discovery is of considerable interest to the electrical industry in many ways. Alcohol is a constituent of a great many oils and varnishes and other insulating compounds and is used for many other purposes in electrical establishments. The use of a low-priced alcohol instead of gasoline for internal-combustion motors will undoubtedly increase the number of small isolated power plants, with the consequent increase in the amount of electric lighting and power applications on a small scale. One of the fields that the electric industry has found it hard to enter has been that of the lumber mills, because they have had so much wood waste to dispose of that they have used it under their boilers for the making of steam to drive their machinery. Now that there is a market for this wood waste, either through selling it to large alcohol manufacturers or the establishment of a by-product plant at the mill, this should open up a good field for the central stations.

Another important feature of this new process will be that annually millions of bushels of corn and barley now used in the manufacture of grain alcohol, will be released for food purposes. The new process should add greatly to the world's food supply and keep down the price of corn, and allow large quantities of the annual crop to flow into the food-manufacturing channels instead of to the alcohol makers. The present annual consumption of alcohol in the United States, including that used in beverages and in the arts and crafts, is placed at 125,000,000 gallons at 100 degree proof. The development of a process of manufacturing cheap alcohol will not only reduce the large amounts expended annually along present lines, but should also allow the use of it in a great many directions where the present high price has prevented its adoption.

The process of turning sawdust and other lumber waste into alcohol consists chiefly of supplying raw material to a large metallic revolving drum, where it is treated under steam pressure for a short time, in the presence of acid. A portion of the wood is converted into glucose, which is then washed off and carried to large tanks, where it is fermented. From these tanks it passes through large stills and is then rectified, producing 190-degree proof ethyl alcohol. This work is carried on in the presence of one of the United States government gaugers and is subject to the regulations of the internal revenue laws.

The great value in the process as developed by the Standard Alcohol Company lies in the short time required for the acid treatment, and the consequent economy in handling large quantities of material. The waste from this process may be briquetted and dried, giving a fuel of approximately the same calorific value as wood containing an equal amount of moisture.

Havana Winter Festivities.

The City Council of Havana, Cuba, plans this year for an elaborate programme during the Winter Festivities. This will call for a lot of electrical work. Manufacturers, supply houses, contractors, and others interested, should communicate with Remigio Jimenez, engineer, Malecon 240 Altos, Havana, Cuba.

DETAILS OF WATT-HOUR METER MANUFACTURE.—IV.

BY JOSEPH B. BAKER.

FIELDS OF COMMUTATOR METERS.

Series Fields.—The series fields of commutator meters, through which the load current passes, are form-wound, and rigidly supported from the meter shield by brass straps or shoes. It was formerly the practice to shellac and bake the field windings, but the blistering of the shellac and carbonizing of the cotton caused by accidental overloads or short-circuits in service, and the still more objectionable "gumming up" of the register and top bearing caused by the condensation of shellac-laden fumes after such overloads, have caused many manufacturers to give up the use of shellac in favor of other in-

FIG. 26.—SERIES FIELD COILS OF OLD-STYLE T R W METER.

sulating compounds that are not subject to this trouble.

The coils are usually wound with a single strand, in several layers, with a sufficient number of turns to give the requisite strength of field throughout the range of the meter. Switchboard meters, and other meters of large capacity, however, have fields of special design, sometimes in the form of heavy copper castings or forgings of very large carrying capacity.

Old-style commutator meters were equipped with rectangular fields (Fig. 26

FIG. 27.—ADJUSTABLE SHUNT-FIELD COIL FOR T R W METER.

is a view of the right-hand and left-hand field coils of an old-style T R W meter), corresponding to the armature of rectangular cross-section that was then employed; but new-style meters of practically all makes have circular fields, which are more compact and efficient electrically in conjunction with the new-style spherical armature, since they give a powerful field with relatively low "drop loss." The idea of concentration is further carried out by the use of ribbon wire in the field winding.

In the type C-6 T R W meter the series fields are edgewise wound of copper strip, insulated with enamel, which is baked on at a temperature that would destroy the cotton and shellac insulation formerly used. These new field coils will thus withstand overloads which would destroy the older meters without giving off any fumes or smoke. One coil is placed in front of the armature and the other behind it, the coils being supported from the meter frame. Each coil is made with an outer and an inner section, a construction which facilitates the building of

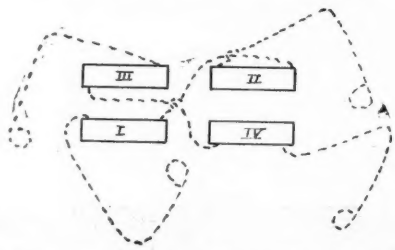


FIG. 28.—CONNECTION OF SERIES COILS IN WESTINGHOUSE TYPE C INDUCTION METER.

both two-wire and three-wire meters of an extended range of capacities. For the lower capacity meters the field-coil sections are all placed in series; for the higher capacity meters the sections are placed in parallel, or each section may consist of a number of strips wound in parallel.

Shunt Fields.—The shunt fields (friction-compensating coils) for commutator meters are of fine wire, and are placed in series with the armature and resistance and bridged across the mains. They are either form-wound or wound on spools, according to the make and capacity of the meter. They are also either adjustably supported inside of and in alinement with the main fields, as, for example, in the General Electric and Westinghouse meters, or provided with taps, whereby a greater or less number of the turns in the coil may be cut into the shunt circuit of the meter, as in the Duncan meter. Fig. 27 is a view of an adjustable shunt-field coil for a rectangular-armature type T R W meter.

The combining of the shunt-field coil and resistance card in one coil is a feature of certain modern commutator meters. In the first forms of T R W type C meters, the resistance in series with the armature was wound upon a tube in two sections, connected non-inductively. These resistance coils, as well as the shunt-field coil for friction compensation, were wound upon universal winding machines. The present type C-6 meters for circuits up to 250 volts have the resistance and shunt field combined in one coil. This coil is wound on the universal winding machine, but in two sections, so connected as to oppose each other's magnetic effect, one section having an excess of turns just sufficient to produce the

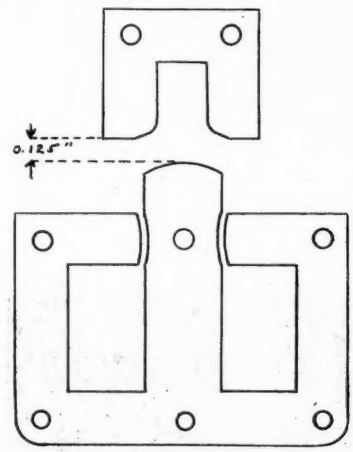


FIG. 29.—LAMINATIONS FOR FIELD CORES OF INDUCTION METER.

necessary field for friction compensation. Thus the entire coil acts as the resistance, whereas the effective turns, only, give the friction compensation.

FIELDS OF INDUCTION METERS.

Series Fields.—Series coils of Westinghouse type C induction meter (BB in Fig. 21, page 388 of the preceding issue) are form-wound, taped with silk ribbon, dipped in insulating varnish, and baked. Two-wire and three-wire single-phase and polyphase meters of five-ampere to eighty-ampere capacity comprise perhaps ninety-five per cent of the induction meters that are manufactured. In this range of capacities, the current coils are of wound insulated wire in the five-ampere size, of square insulated wire in the ten-ampere and twenty-ampere sizes, and of square, bare copper strap in the forty-ampere and eighty-ampere sizes. All of these coils are guaranteed to carry fifty per cent overload continuously.

A special feature of all series windings is that they are made without joint of any kind between the two coils of the winding; each winding consists of a single length of wire, or strap, carried over from one coil to the other. A soldered joint would be liable to become heated and open up when the coil was overloaded. Such overloading is liable to occur for long periods, because central-station companies have a tendency to install undersized meters on consumers' loads, on ac-

count of their comparatively low cost and good light-load accuracy.

In all meters the series windings are made up to have eighty ampere-turns on each pole-piece. For example, the eighty-ampere winding has one turn per coil, and the five-ampere winding has sixteen turns per coil.

The "series" for three-wire meters consist of two separate windings, each with two coils. Each winding is like the winding for two-wire meters, except that more length is allowed in the "loop"—*i. e.*, the length of wire or strap continuous with and joining the two coils—in order to permit the four coils of the complete series field to be laid up, as shown in Fig. 28, for mounting on the core. Coils I and II constitute one winding, and coils III and IV the other winding. In this sketch the coils are shown spread apart compared to their actual position, in order to facilitate tracing the terminals. This arrangement gives the same current-winding flux from one winding as from the other, since the average distance of both coils of each winding from the disk is the same.

A breakdown potential of 4,000 volts is applied to the pair of windings for three-wire meters—after they are laid up together as shown in Fig. 28, but before assembling—to detect any weakness of insulation between the two windings; and a breakdown potential of 2,000 volts is applied after assembling on the iron core. A potential of 1,250 volts is applied between series and shunt coils and core, on both two-wire and three-wire meters, at various stages of the manufacture of the meter, the final test being applied after the meter is finished and calibrated ready for sealing.

The laminations for the series field core are U-shaped stampings of a special quality of transformer steel, 0.013 inch thick. The shape of these stampings is shown in the upper outline of Fig. 29, which also shows the relative positions of the series and shunt fields as mounted in the meter. The core (B_1, in Fig. 21) consists of a bundle of these stampings, over which the coils are slipped, as shown in the three views of the series fields of the ten-ampere, two-wire meter, Fig. 30, in position in the meter looking from the back, up from the bottom, and down from the top, respectively. For clearness the terminals are omitted in the two lower views.

The work of assembling the core and windings is done by girls, who make up a bundle of the stampings containing fewer pieces than the full core, so that when packed together the coils will slip easily over the two limbs of the core without danger of cutting through the insulation of the coils. Then the pack of stampings is pried open in the middle with a blade, and additional stampings inserted to bring the core up to the full gauge thickness, three-fourths inch. Lastly, the coils are held in place on the core by turning over—*i. e.*, bending at right angles—the ends of the last two stampings at each end of the core, as shown in the two upper views of Fig. 30. This operation secures the coils against any possibility of shifting on the limb of the core, which would destroy the calibration by altering the mean distance of the coils from the disk air gap.

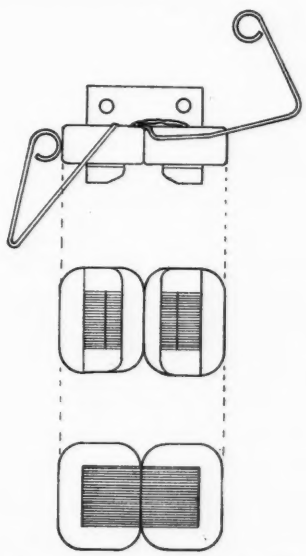


FIG. 30.—VIEWS OF SERIES FIELD OF INDUCTION METER.

Shunt Fields.—Shunt coils of type C meter (A in Fig. 21) are identical for meters of the same potential, irrespective of the capacity of the meter, and comprise coils for meters for 100, 200, 400, and 500 volts and over, potential transformers being used to excite the shunt field for potentials above the last mentioned.

These coils are machine-wound, on the Varley automatic winding machine, using double silk-covered wire. This machine turns out eight coils at a time, on the same form, with paper of high dielectric strength between every two layers. It gives a much better product than hand winding, by insuring evenness of tension and compactness of wire. Moreover, the coil is a more powerful one, inasmuch as a given number of turns are in a smaller space, with lower resistance. These machine-wound coils seldom have opens, short-circuits or grounds, and are very sturdy under extraordinary high potentials, such as surges from lightning discharges. After cutting apart the form for the coils, each coil is taped with "empire cloth," to insulate the coil as a whole, and well-insulated flexible leads having open-hook terminal clips are soldered on. The leads are nine inches long, from coil to end of terminal clip. The connection of the clips is made secure by bringing the flexible strand through the sleeve of the clip, and then through a small hole beyond the hook end of the sleeve, before sweating the solder in. This construction holds the strand of wire in firm contact with the clip, independent of the solder. The coils are then taped with silk, and dipped and baked, before mounting on the field core. The coil is tested for opens and short-circuits, and after mounting on the core, for grounds.

The apparatus for testing for short-circuits and grounds may consist of a step-up transformer, with its primary connected to 100-volt mains. The secondary is provided with taps for giving various testing potentials, and a fuse. Tests for grounds are made after assembling on the shield, before assembling shield and coils in case, and just before shipment of meter.

The lower outline in Fig. 29 shows the shape of the shunt-field core stampings. It is of transformer steel, of the same thickness and quality as the steel for the series-field core, described above. Figs. 31, 32 and 33 are views of the complete shunt field assembled; in position looking down from the top, looking from the side, and looking from the back of the meter, respectively (see also A and A', Fig. 21). The terminals are omitted from Figs. 31 and 32 for clearness. In assembling the core, essentially the same method is employed as for the series fields—by making up a partially complete pack of stampings, over the center limb of which the shunt coil is slipped, and then making up the correct number—except that the last stampings are added at the end of the pack, on account of their shape. The thickness of the complete core is gauged to three-fourths inch by a C gauge. The coil is held in place by the brass angles *a, a*, having one limb slotted to take the flat-head screw *b*, passing through the top hole in the center limb of the core. With the coil forced down against the inside bottom of the core, the nut is tightened on the screw, thereby securing the coil against shifting.

TERMINALS AND TERMINAL CHAMBERS.

Fig. 34 is a sketch, partly in cross-section and partly in elevation, of the four-binding-post terminal strip with which Westinghouse type C single-phase induction meters of five, ten, and twenty-amperes capacity for house service are equipped. The forty-ampere and eighty-ampere meters have a strip of similar design, but of heavier construction, throughout. This terminal chamber is separate, and separately sealed, from the meter compartment proper (see Fig. 20), so that the installation man and inspector can get at the binding posts without having to take off the meter cover. The terminal chamber is a light cast-iron plate. The cover posts are now put in the same way as the meter-compartment cover posts.

In Fig. 34, the left-hand binding post is shown in side and front elevation, and the adjacent one in section, the center lines only of the remaining two binding posts being indicated. The strip on which the binding posts are mounted is built up of the two thicknesses of fiber *A, A,* which are punched to receive the half-round bottom ends of the binding posts, and of a similarly punched strip of felt B, which serves as an insect, dust, and moisture-proof gasket, or seal, between the terminal chamber and the meter compartment.

On all two-wire meters below eighty-ampere capacity, the two middle terminals are connected by a brass short-circuiting strip. The terminal strip, assembled, is mounted in the case after the latter has been japanned, by forcing the strip up against the partition between the top of the meter compartment of the case and the bottom of the terminal chamber, under heavy pressure, employing a toggle cam, and then securing it by four screws passing through the fiber strip and tapped into a pair of short brass punchings (not shown in the sketch) resting against the lower edges of the terminal chamber. The center lines of the holes for these screws appear in the sketch.

Each binding post consists of a round brass body, having the bottom end, where it passes through the felt and fiber strip, milled off to half-round shape as a terminal for the meter contact. The part above the strip is drilled longitudinally to receive the wire of the consumer's installation, the connection to this wire being made by the two iron screws *D*. The binding post is insulated from the meter case, where it passes through the latter, by the hard-rubber bushing *C*.

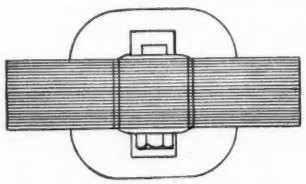


FIG. 31.—TOP VIEW OF SHUNT FIELD ASSEMBLED.

The polyphase meters for house service have two terminal chambers, one on each side of the meter case. The single-phase and polyphase meters for switchboard service have binding posts of the regular type, mounted on insulating blocks on the flange of the meter case. The direct-current meter, which has no separately sealed terminal chamber, has binding posts of special type, located in the back of the case and accessible from the front when the cover is removed.

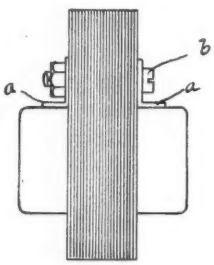


Fig. 32.—Side View.

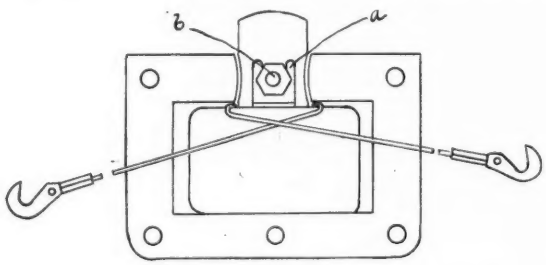


Fig. 33.—View from Back of Meter.

SHUNT FIELD ASSEMBLED ON CORE.

NAME PLATES.

The meter name plate may be of plain or nickel-plated brass, etc., riveted or screwed to the bottom of the shield, and is stamped with the ampere capacity, volts, cycles, style, and serial number (factory number) of the meter.

More than one name plate is sometimes provided, to facilitate the ascertaining of the capacity, number, etc., by the meter inspector, when the meter is installed in a dark corner or other difficult place. For example, in meters with glass covers a duplicate name plate may be placed on the front of the damping magnets' shoe, with the factory number in large figures, which can easily be read through the glass. On metal-cover meters the factory number may be stamped on the cover, near the bottom.

[*To be continued.*]

To Help American Exports.

At the suggestion of the State Department instructions have been issued to consular agents by Acting Secretary McHarg of the Department of Commerce and Labor to make collections of commercial laws of all of the Central and South American republics. These laws will be printed in the English language and distributed in this country for the purpose of encouraging trade in Central and South America.

The Department of Commerce and Labor will loan to the State Department two of its special agents to aid in investigating trade conditions. These men will be paid out of the special fund of $100,000 given to the State Department during the special session of Congress. The men to be used are William E. Davis, of Minnesota, who has been investigating milling conditions, and Charles N. Pepper, of Washington, D. C.

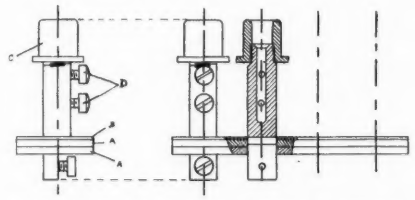


FIG. 34.—TERMINALS OF TYPE C INDUCTION METER.

Important Electrical Papers at the British Association's Convention.

The principal electrical papers which were read before the engineering section of the British Association at the Winnipeg convention, which began on August 25, were as follows: "Distribution of Dielectric Stress in Three-Phase Cables," by Dr. W. M. Thornton (Durham College of Science) and O. J. Williams; "Losses from High-Tension Overhead Lines Due to Brush Discharge," by E. A. Watson, and "The Calculation of the Charging Currents in Three-Core Cables and Overhead Transmission Lines Supplied with Three-Phase Currents," by Prof. E. W. Marchant, Liverpool University.

Sir William H. White, late chief constructor to the British Navy, was chairman of the Section.

The Boston Electrical Show.

An electrical show, the first of its kind in Boston, will be held in the great exhibition hall of the Mechanics' Building on November 15 to 25, inclusive, as already briefly announced in a previous issue. Exhibits will be made by the leading electricians and electric supply houses in America, and all the novelties in time, labor-saving and comfort-giving devices, in fact, everything up-to-date in the electrical world, will be displayed and operated.

The decorations and lighting effects will be novel and elaborate. Expense will not be spared to this end. Chester I. Campbell, the well-known exposition promoter, will have entire charge of all the details.

Many of the exhibitors have already submitted plans for their spaces which involve the expenditure of thousands of dollars, and, from present indications and the enthusiasm displayed upon the part of the general trade, the exposition will prove an educational treat.

Special departments will consist of exhibits of the amateur wireless operators and unique inventions and ideas of amateurs. Prizes will be awarded to the deserving suggestors or inventors of practical ideas.

The association promoting the exposition is known as The Electrical Exposition Association, and is composed of many of the leading concerns and individuals in the electrical trade. C. W. Holtzer is the president, A. B. Tenney, of the Malden Electric Light Company, is the vice-president, and the executive committee includes G. M. Stuart, of the Stuart-Howland Company, W. H. Atkins, of the Boston Edison Company, J. N. Keller, of the New England Telephone and Telegraph Company, Herbert S. Potter and Frank J. Stone, of the Electric Storage Battery Company. The advisory board includes prominent officials of the Westinghouse, Cooper Hewitt, General Electric, and other well-known companies.

Any exhibitor may become a member of the association and share in its profits, the object being, by the hearty co-operation of its members, to hold exhibitions that will advance the interests of the trade. All communications as to particulars, plans and applications for membership or space should be addressed to Chester I. Campbell, General Manager, 5 Park Square, Boston, Mass.

It is hoped that the Boston electrical show will become an annual feature like the shows of Chicago and New York.

Public Service Investigation.

Senator George A. Davis, chairman of the legislative committee which has been appointed to look into the question of whether the public-service commission laws of New York state should be modified so as to place the telephone and telegraph companies under the supervision of the two commissions, in speaking of the committee's future work, states that the committee will first "investigate the telephone and telegraph question, and ascertain if the companies are giving efficient service, and whether we should place them under the jurisdiction of the Public Service Commission. It is hard to say just what we will do, but our scope of resolution is broad enough to pursue the widest form of investigation, and we shall not only confine our attention to Manhattan, but to other cities up-state that need the matter of telephone service looked into.

"It is rumored that we are to investigate the Public Service Commission itself and determine whether that board has rendered the services it was created for. This, of course, we can do, and doubtless we shall probe into the alleged failure of the commission to act speedily on the B. R. T.'s right to charge ten cents to Coney Island, which question has been before the commission for nearly eighteen months.

"We hope to begin public hearings about December 1, and clear the whole matter up in time to submit our report to the Legislature at the opening of the session."

The Japanese-British Exhibition.

The plans have been completed for the Japanese-British Exhibition, to be held next year at the White City, Shepherd's Bush, London, Eng., under the auspices of the Japanese Government and with the approval of the British Government. It is announced, says the (London) *Electrical Times,* that on the occasion of this exhibition the nobles of Japan will pour out, from the treasures they have accumulated for centuries, works of art never before seen in this country and only by a favored few in Japan. Prince Arthur of Connaught, as honorary president, and the Duke of Norfolk, as president, have issued an appeal to possessors of the treasures of British art to make a like revelation of their works, many of which are but little known to the general public, so as to equal, and if possible eclipse the display made at the Franco-British Exhibition.

Telephones in Brazil.

Consul-General George E. Anderson, of Rio de Janeiro, reports as follows on telephones in Brazil and the demand for supplies which the extension of the system will create:

An American company which is constructing a system for the state of Rio de Janeiro secured its concession about three months ago, and already has the construction of the system well under way. One of the chief objects of the enterprise is to afford communication by telephone between the city of Rio de Janeiro and the country surrounding it, including Petropolis, the summer capital of the country, Nictheroy, the capital of the state of Campos, and other important points.

There is great need in Brazil of telephone service in many parts of the country not reached by the government telegraph system, or in which the telegraph system does not meet the requirements of business. Although Brazil has twenty states and a territory substantially the same as that of the contiguous territory of the United States, it has no interstate telephone line, and, by reason of the interstate restriction, it has few telephone lines serving rural districts within the several states themselves. The telephone business in Brazil is little developed in either extent or service.

According to official returns, there exist in Brazil a total of thirty-nine telephone systems, ranging from twenty-two to 2,503 subscribers, of which at the time the statistics were prepared, last year, fifteen were Berliner, nine Kellogg, three Bell, four American, and the others German, Swedish, Norwegian, and French. The total number of subscribers in all the systems is 9,200. The capital of the companies ranges from $900 to $1,190,000. Of these companies, only five have more than 500 subscribers, viz., Bahia, Rio de Janeiro, Pernambuco, Pelotas and Sao Paulo.

[A list of telephone companies doing business in Brazil, with data for each, is on file in the Bureau of Manufactures.]

New Supply of Radium.

According to reports from San Francisco, a new immense supply of pitchblende, said to be enough to supply the world with radium for a long time to come, has been discovered on the McCloud River, north of Kennetta, Cal. It is expected that the price of the rare element will be reduced in consequence.

German Taxes on Electric Lamps.

The new taxes on electric lamps and gas mantles have been approved by the German Reichstag and will go into effect in October next. The estimated annual income from this source is $5,000,000.

The scale of taxes is as follows, the first figure in the parentheses referring to carbon-filament lamps, and the other to metallic-filament, Nernst, and other incandescent or glow lamps: Lamps consuming up to fifteen watts (1.25 cents; 2.5 cents); from fifteen to twenty-five watts (2.5; 5.0); from twenty-five to sixty watts (5.0; 9.6); sixty to 100 watts (7.5; 14.5); from 100 to 200 watts (12.0; 24.0).

Carbon-filament lamps of over 200 watts are taxed twelve cents for the first 200 watts and six cents each for each further 100 watts or fraction thereof, and metallic-filament, Nernst and other lamps twenty-four cents, plus 9.6 cents per lamp for each 100 watts or portion thereof in excess of 200 watts consumption.

Gas mantles are taxed 2.5 cents each.

Arc-lamp carbons are taxed 14.4 cents per kilogramme of weight when made of pure carbon, and twenty-four cents per kilogramme for special carbons, as for flaming arcs. Mercury-vapor tubes, etc., are taxed twenty-four cents for each 100 watts or fraction thereof.

The tax is to be paid by the manufacturer by the use of revenue labels on the packages, before the finished and packed products are removed from the rooms of the place of production.

In the case of imported articles, the tax has to be paid by the importer on clearing the Customs House, or, if this does not take place, it has to be paid within a period of three days after reception.

Telephone Train Dispatching.

The telephone is to take the place of the telegraph in the dispatching of trains on the Fitchburg division of the Boston & Maine Railroad. The officials expect that the new equipment will facilitate the handling of traffic, and it is likely that other divisions of the Boston & Maine will be similarly equipped.

Following the innovation of other railroads, the Lehigh Valley Railroad has decided to install a telephone system along its line, believing this method of running trains superior to the telegraph. Work has been begun on the installation of a telephone line from Mt. Carmel to Easton, Pa., at a cost of $40,000.

Brooklyn Rapid Transit Company's Annual Report.

The annual report of the Brooklyn Rapid Transit Company, made public last week, shows gross earnings from operation for the year ended June 30, last, of $19,694,462, which is a decrease of $176,104 from the preceding fiscal year. There was, however, a reduction in the operating expenses of $544,923, which leaves an actual gain of $368,819 in the year's net earning from operation. The report shows that the slight loss in the gross was due to a variety of causes—chief among them the general depression in business which brought about a considerable decrease—$358,479—in the last six months of 1908, as compared with a similar period of 1907. In addition to this, the railroad's contracts with the American Express Company and through the American Railway Traffic Company for final disposition of the city's waste expired in December last, which represented a decrease of $265,809 in the gross earnings. Passenger traffic improved radically from the beginning of the calendar year, so that the fiscal year represented an increase of $128,529 in this feature of the company's earnings.

From the $19,694,462, which represents the company's gross earnings for the year, $11,394,654 is deducted for operating expenses, leaving a balance of $8,299,807, to which is added $605,817 as income from other sources, making a total income of $8,905,624, an increase of $296,812. Deducted from total income, $6,969,015 is taken for taxes and fixed charges, which leaves a net income of $1,936,609. A surplus in the company's treasury of $3,853,459 was carried forth from June 30, 1908, and after adding to this the net income of the fiscal year just closed and deducting from it bond discounts, the two initial quarterly dividends of the company and other charges, the substantial surplus of $4,387,229 remained in the company's treasury at the close of June 30, last. President Winter calls attention to the fact that his company expends $200,000 annually maintaining city paving, moving tracks for sewer construction and the like, and gives over $300,000 worth of free transportation to members of the police and fire departments in the course of a year. These, to the company, are, in effect, additions to its regular tax burdens. Mr. Winter also issues a protest against the recent federal tax on corporation net income. This, if upheld by the courts, will entail an additional annual charge of about $50,000 upon the companies of the Brooklyn Rapid Transit system.

The president of the Brooklyn Rapid Transit also draws attention to the extent the railroad is becoming insurer and co-insurer of its properties. Of the insurance fund, which has been invested in outside securities by the insurance trustees, $51,428 was accumulated prior to November 15, 1907. The balance of $57,070 represents the amount set aside since that date from operations under the insurance agreement entered into between the respective companies of the Brooklyn Rapid Transit system nearly two years ago. The insurance funds have been invested in securities of a par value of $110,000, which yield an annual income of $4,950.

The report shows that the property was brought through a year of financial depression with slightly increased net earnings at the end of the twelvemonth.

Navy Department Supplies.

The Bureau of Supplies and Accounts, United States Navy Department, will open bids in Washington, D. C., on the date stated below, for the following material. Bidders interested therein should fill out application card, giving the schedule numbers desired, and forward same to the bureau without delay. Applications will be filed as soon as the schedules are received from the public printer. Schedules can also be obtained upon application to the Navy Pay Office nearest each navy yard:

OPENING SEPTEMBER 28, 1909—MISCELLANEOUS.

Compressor, motor-driven	1	Mare Island, Cal.	1612
Equipment, turret-turning	Miscellaneous	Puget Sound, Wash.	1612
Pipe, air	100 feet	Mare Island, Cal.	1612

OPENING SEPTEMBER 14, 1909—ELECTRICAL SUPPLIES.

Drills, electric	Miscellaneous	Washington, D. C.	1647
Fuses, switch	6	Boston, Mass.	1629
Conductors	Miscellaneous	Boston, Mass.	1629

Bids will be opened on September 21 for three motor cranes and one motor-driven pump, for delivery at Mare Island, Cal.

3,000-Mile Wireless.

Army officers at Washington, D. C., having in charge the selection of a site for the erection of a 3,000-mile wireless-telegraph station, are now considering several proposed locations near Washington. A site in Georgetown, D. C., is said most likely to be selected.

Aluminum Casting Foundries Merged.

Announcement is made by officials of the Allyne Brass Foundry Company, of Detroit, Mich., of an important consolidation of aluminum casting establishments throughout the country, and that the principal plant is to be located in Detroit.

The Aluminum Castings Company, just incorporated in Ohio, is the absorbing company. The position it occupies in the industrial world is something like that of the General Motors Company, which has been acquiring the stock of automobile companies. The Aluminum Castings Company, with a capitalization of $800,000, acquires the properties of the Allyne Brass Foundry Company, Cleveland; the Allyne Brass Foundry Company, Detroit; the Allyne Brass Foundry Company, Buffalo; the Syracuse Aluminum and Bronze Company, Syracuse; the Eclipse Foundry Company, Detroit, and the United States Aluminum Company, New Kensington, Pa. All these acquisitions are made at one time. The capitalization hardly represents the business, for the Allyne Company of Detroit alone turns out $1,000,000 worth of castings a year.

The announcement of the consolidation follows on the heels of the purchase by the Allyne people of twenty-three acres of land on Chene Street, not far from the Boulevard, Detroit, on which large foundry buildings are to be erected at once.

May Enlarge Subway System.

According to some tunnel builders, the Hudson & Manhattan Railway Company is likely to build a few years hence a tunnel from Constable Point, at Bayonne, N. J., to New Brighton, Staten Island, connecting with the lines of the Staten Island Rapid Transit Company at St. George.

Between Constable Point and Jersey City trains will run, it is said, over tracks built on the surface, which may be constructed through Bayonne at comparatively small expense, thus affording a practical solution of the problem for transportation between Manhattan and the large, attractive residential areas in Staten Island.

The estimated time between St. George, Staten Island and the Terminal Building, New York city, is given as seventeen minutes.

The General Electric Company is employing at present about 25,000 workmen, an increase of about 1,500 since February 1.

Lights for Hudson Fete.

Some 10,000 men are adding to the electric lights New York city always has in service tens of thousands more for the Hudson-Fulton Celebration. The wiring of the four bridges over the East River has been completed, and fully half a million lights will be used in this public illumination. The battery of lamps which will illuminate the Palisades will consist of some one hundred searchlights of several hundred thousand candlepower.

Private enthusiasm for illuminating the city will supplement the work by the municipal authorities. It is planned to make Fifth Avenue, from the Washington Arch to Fifty-ninth Street, one blaze of light, the Fifth Avenue Association having taken this enterprise in hand. Along the North River the steamship and railway piers are being strung with electric lights, and the people whose homes front the Hudson River are letting contracts for big illuminations.

The American Exposition, Berlin, 1910.

In connection with the American Exposition at Berlin, in 1910, it is announced that Prince Henry, of Prussia, has accepted the honorary presidency of the exposition, and that J. Pierpont Morgan and Thomas A. Edison have joined the honorary American committee.

The Hamburg-American Line and the North German-Lloyd have announced a further reduction of freight charges, making a total reduction of thirty per cent.

Arrangements have been made whereby exhibitors who do not intend to send a man of their own to Berlin can have their exhibits unpacked, installed and demonstrated, for a moderate charge, by a special Sales Office and Bureau of Information, established in the Exposition Palace, so that it will only be necessary for them to ship the goods to New York to be taken entire care of from there on by the exposition managers.

As already announced, the exposition aims, by bringing together in a magnificent Exposition Palace, much larger than Madison Square Garden, New York, in the commercial heart of Europe, a representative collection of the best that American ingenuity, skill and experience can produce, to foster and strengthen our trade relations with Germany and to increase American exports generally. It will be a unique enterprise also in that it will be an exposition without extras, all incidentals being included in the space-rental.

Staten Island Subway Plan.

George von Kromer, chairman of the Citizens' Tunnel Committee of Staten Island, called upon the New York Public Service Commission recently with plans for a subway route that will, according to Mr. von Kromer, prove a solution of the transportation difficulties of Staten Island.

The line will be a continuation of the Brooklyn Fourth Avenue route and will run from One Hundred and First Street and Fourth Avenue, in the Borough of Brooklyn, under the Narrows to Rosebank, Staten Island. A similar plan was filed with the commission last May, but in the new route suggested a far better service will be operated to Staten Island if this line is constructed.

New Electrical Industry for South Africa.

Consul Edwin N. Gunsaulus, of Johannesburg, writes that in addition to the great scheme for supplying power to the Rand, a new company, to be known as the Pretoria Power Company, is being formed to supply power and to manufacture, at a hydroelectric station on Crocodile River, nitrate of lime and nitric acid. Three large banks in Europe are said to be supplying the capital. For the initial works, which are to furnish 20,000 to 25,000 horsepower, $3,469,875 will be required, and for the nitrate of lime and nitric-acid works $1,250,000 additional will be necessary. The present cost of nitrate of soda delivered to South African ports is about $54 per ton, while nitrate of lime, which serves the same purpose as a fertilizer, can be produced and sold, it is said, at half of that price in the Transvaal. There is at present a very considerable demand for nitric acid in South Africa for use in the manufacture of dynamite for mining purposes.

Electric Cargo-Handling Appliances.

The British vice-consul at Spezia, Italy, in a recent report describes some of the electrical appliances now in course of erection at that port. Four electric cranes will raise coal, or ore, in buckets from the holds of ships, transport it horizontally, and discharge it into wagons or on the wharf at the rate of 2,000 tons of coal or ore per day of ten hours. Two electric cranes are also being fitted with grain-discharging apparatus, each being capable of handling about thirty-six tons per hour.

Reports on Electric Meters.

The New York Public Service Commission has held a hearing on August 30 for the purpose of determining whether, in order to insure the reporting of all tests of electric meters, according to a standard form of report, an order should be issued by the commission containing substantially the following provisions:

That every electrical corporation operating within the First District shall file a monthly report stating the results of all tests of electric meters tested for accuracy by the company during that month; and every such corporation operating in both the First and Second districts shall report to the commission for the First District as to meters installed upon premises within the First District only; such reports to be filed not later than the fifteenth of the following month; all tests to be made in conformity with the regulations of the commission and under actual operating conditions. Each meter is to be tested independently, and not while connected in series with one or more other meters unless the potential circuits of each meter is so arranged as not to be fed through the field of any meter under test or rotating standard.

Direct-reading indicating wattmeters shall not be used as standard instruments in making tests of consumers' meters, and wherever possible tests shall be made on three loads, namely, at one-tenth of the full rated capacity of the meter at normal load and at the full rated capacity of the meter, and the average of these three tests shall be deemed the condition of the meter, and reported to the commission. Where it is impossible to reach either ten per cent of the rated capacity or 100 per cent of the rated capacity, tests shall be made at minimum, maximum and normal load and values given in the ratios stated above.

Coal-Cutting Machinery in Great Britain.

In a recent issue of the *Iron and Coal Trades Review*, of London, Eng., some interesting figures are given of the increased use of electrically driven coal-cutting machines. The latter made a gain of eighty-three machines in Great Britain in 1908 over 1907, while compressed air made a gain of only seventy-two machines. In Scotland the preponderance is greatly in favor of electrical machines, and slightly so in the Midlands, although as yet the compressed-air machine is still on the whole in the ascendancy.

New York Service Board to Exhibit.

In response to an invitation from the New York State Commissioner of Agriculture, the Public Service Commission for the First District of the state of New York will make an exhibit at the State Fair, which opens at Syracuse September 14. Space in one of the buildings has been allotted to the commission, and the exhibit will be installed early next month.

Some of the charts, maps, etc., which formed a part of the City Planning Exhibition, held in New York last winter, will be a part of the exhibit, and much new matter will be added. There will be charts showing the immensity of passenger-transportation business in Greater New York, as compared with other large cities of the world; maps showing the various transportation lines in the city; a graphic chart illustrating the hourly ticket sales on subway and elevated lines and at the East River ferries; a map showing the scenes of accidents on railroads and street railroads and the districts in which most accidents occur; a series of photographs showing the results of the commission's fender tests at Schenectady and Pittsburg; statements of accidents on railroads and street railroads covering the last two years; photographs of the testing of gas and electric meters and of the electric-meter laboratory of the commission; maps showing proposed rapid-transit lines and the existing subway and elevated roads; photographs of typical subway construction and various other photographs, maps and documents illustrating the work of the commission.

No All-Red Cable Line.

The negotiations which Canada entered into with Great Britain and the other states of the empire contemplating a cheaper cable and telegraphic service around the empire, are at an end. Three weeks ago Canadian Postmaster-General Rodolphe Lemieux was still under the impression that the cheap empire service was possible, but at one of the last meetings of the cabinet that he attended it was determined that Canada would not at present become a party in any such movement.

The Parsons Turbine in Shipbuilding.

According to the new volume of Lloyd's Register, just published, no less than thirty-four out of 101 steamers listed as being capable of making over twenty knots an hour, are fitted with Parsons turbines.

Hudson & Manhattan Railroad.

The Hudson & Manhattan Railroad Company announces that the subway stations at Twenty-eighth Street and Thirty-third Street, borough of Manhattan, will be opened on May 1 next. They would have been opened at an earlier date, but owing to the fact that the subway is to be extended north to Bryant Square and under Forty-second Street, it has become necessary to change the plan somewhat, so as to put the subway on a lower level at Thirty-third Street than had been originally intended. This is because of the fact that the subway is to go underneath the Interborough subway in Forty-second Street.

The tunnel is now entirely completed as far north as Twenty-seventh Street, and it would be possible to run through trains from the Cortlandt Street terminal to Jersey City, Pavonia, Hoboken, Christopher Street and Sixth Avenue to Twenty-third Street. This will be done as soon as the necessary car equipment is procured, but no definite date can be given at the present time because of the trouble at the Pressed Steel Car Works at Schoenville, Pa.

Reduction in St. Louis Lighting Rates.

Reductions in the lighting rates to consumers in St. Louis will result from modifications of the "guarantee requirements" of the Union Electric Light and Power Company, according to Vice-President and General Manager Alten S. Miller. The reductions will come principally from the facilities for making lower contracts and from prices paid for the current actually used.

The company, heretofore, has demanded a guarantee of no less than $2 a month on lighting contracts, and of no less than $3 a month on power-service contracts. From now on the minimum guarantee on lighting contracts will be $1 a month, instead of $2, and the minimum guarantee on power-service contracts will be $1.50 a month, instead of $3.

Consumers are at liberty, also, to combine their light and power service in one contract. Heretofore, two contracts have been made, one for lighting and one for power service. Now, if the consumer finds he can get a lower rate on both light and power service at the lighting rates, he can make one contract and use the rates in the lighting schedule. But the one contract cannot, for obvious reasons, be made on the rates of the power-service schedule.

Chicago Adopts a Systematic Scheme of House Numbering.

In accordance with the municipal ordinance which went into effect on September 1, a very extensive renumbering of the houses in Chicago has been carried out. This was the result of much deliberation on the part of the city authorities and has been planned to facilitate greatly the location of any addresses within the city limits. As the addresses of a very large number of business firms, as well as most of the residents, have been changed by this ordinance, it will be worth while describing the system.

Madison Street has been made the base line for all numbers on the north and south streets. State Street has been made the base line for all east and west streets. Eight hundred numbers are assigned to each mile, and these are subdivided into eight groups of 100 each for each one-eighth of a mile. A number such as 3220 West Chicago Avenue will be found a little over four miles west of State Street; a number such as 1928 North Clark Street will be found between two-and-three-eighths and two-and-one-half miles north of Madison Street. As the section lines in the city are exactly one mile apart, and are the most prominent streets, it is quite easy, according to the new system, to locate any number. On the north and south streets south of Madison, the numbering between 1 and 3100 does not conform strictly to this rule, because the east and west streets on the South Side of the city have previously been numbered so that Twelfth Street is one mile south of Madison; Twenty-second Street two miles, and Thirty-first Street three miles. Beyond this point there are 800 numbers to each mile, as in the rest of the city. The numbers on the north and south streets of the South Side have, therefore, not been changed because this system had previously been applied to them.

In the central business district, between the Chicago River and Twelfth Street and Lake Michigan, there has been no change of numbering, since it was feared that too much annoyance to business firms would result. The city, and postal authorities as well, have requested that firms and residents of Chicago whose numbers have been changed should communicate with their correspondents to that effect. In order to hasten the delivery of mail, persons addressing anyone in Chicago, whose new number is not known, should write "Old No." opposite the former address.

Western Society of Engineers.

The Western Society of Engineers has prepared an attractive programme of papers to be presented before its meetings during the first half of the forthcoming season. All the meetings are held in the society rooms, on the seventeenth floor of the Monadnock Block, Chicago. The meetings of the main society are held usually on the first Wednesday of each month, and extra meetings are arranged for the third Wednesday of each month; the electrical section of the society meets, as a rule, on the second Friday of each month. All the meetings are held in the evening, beginning at 8 o'clock.

Among the large number of papers which are in preparation the following are of particular interest to electrical engineers:

"Wood Preservation, from an Engineering Point of View," by a representative of the United States Forest Service; "The Loss of Heat Through Furnace Walls," by W. T. Ray and Henry Kreisinger, Pittsburg; "The Kilbourn Plant of the Southern Wisconsin Power Company," by D. W. Mead, Madison; "Economies in Central-Station Management," by W. L. Abbott, Chicago; "Depreciation and Reserve Fund for Electric Properties," by William B. Jackson, Chicago; "New Illuminants," Carl Wiler, Chicago.

Entertainment at the Denver Conventions.

The entertainment committee of the Manufacturers' Association is desirous of obtaining the names and addresses of amateur specialists who expect to attend the coming conventions at Denver, during the week commencing October 4 next, with a view to continuing the annual supply men's vaudeville performance, which has met with such favor in past years. A. L. Whipple, 50 Church Street, New York city, is chairman of the committee and should be addressed.

Survey Ship "Carnegie" Has Sailed.

The non-magnetic surveying ship "Carnegie," which has been building in South Brooklyn for the Carnegie Institute at Washington, last week started on its expedition for the purpose of making a magnetic survey of the Atlantic, Indian and Pacific oceans, and to gather data about the magnetic attractions and variations in waters hitherto unexplored. The "Carnegie" is proceeding to Gardiner's Bay for compass adjustment and then goes on up to St. Johns, N. F., the coast of Labrador and Hudson's Bay.

American Permanent Sample Exhibition in Germany.

All arrangements have been perfected for opening up a permanent Sample Exhibition at Berlin in the spring of 1910.

This exhibition is designed primarily as an exhibit of distinctively American products, and the management is especially desirous that American manufacturers of novelties shall take part. The intention is to make apparent to the people of Europe, and especially Germany and the Continent, the importance and excellence of American manufactures, and to this end the German committee will advertise the exhibition throughout the Continent and will co-operate with American manufacturers and exporters in every way to popularize and exploit American products.

Blank applications for space and all information in regard to the exhibition may be obtained by addressing the American Exhibition Company, 77 and 79 Broad Street, New York, N. Y.

Ambassador Hill, the Department of Commerce and Labor (Washington, D. C.), James J. Hill, and other authorities have written to express their cordial approval of the scheme.

Installing Telephones for Train Dispatching.

The Chicago & Northwestern Railway Company is installing a telephone train-dispatching system that will include Racine, Wis., as well as every other north-shore town and city along Lake Michigan.

Telephone connections, long in use at North Chicago, Lake Bluff, Lake Forest, Highland Park and other places, are now being installed at Waukegan, Zion City, Kenosha, Racine and every station on the Northwestern from Chicago to Fond du Lac.

The wires for the dispatching system are already installed in the Waukegan station and are being installed at Zion City.

The St. Paul road has a system of telephonic dispatching in operation at present, but the Northwestern system is said to be better and simpler than this one.

The system has not thus far affected the local telegraph-operating system or number of operators employed, and it is believed that in the case of Kenosha and large cities the two systems will be worked side by side.

New copper wires have been strung along this division.

QUESTIONS AND ANSWERS.

TRANSFORMER VOLTAGES, TRANSPOSITION.—1. What primary voltage, 2,200 or 2,300, is best suited for a small lighting plant when a 110-volt secondary is desired? What is the corresponding transformer ratio? 2. When using the rolling method of transposing telephone lines, is it necessary that the same wire always cross over the other in the same direction or can the transposition be reversed? I was told that just so that the wires changed pin position is all that is necessary.—T. F. B., Presho, S. D.

1. The standard transformers of near this voltage range have a transformer ratio of twenty to one, *i. e.*, they are either 2,200/110 or 2,300/115. If exactly 110 volts at the secondary is desired, the former type is to be chosen. More generally it is desired to have a little higher secondary voltage, so as to allow of some line drop between the transformer and lamps or motors, the latter to receive exactly 110 volts. In this case 115 volts at the secondary and 2,300 volts at the primary is selected. 2. It is preferable that a system of transposition strictly uniform throughout a stretch of line between stations be chosen, but it is generally ample if the stretch of line is symmetrically balanced in regard to transposition. For example, if a twenty-mile line is "rolled" uniformly in one direction for ten miles and then equally uniformly in the reversed direction for the remaining ten miles, a balanced line will result. In that portion of a line parallel to a strongly inductive and disturbing circuit the transposition must, however, be uniform and balanced.

WATTMETERS AND WATT-HOUR METERS.—In a number of your recent articles I have noticed the words wattmeter and watt-hour meter used as if they referred to different kinds of meters. Are they not synonymous? If there is a difference between them kindly make it clear to me.—R. H. T., Denver, Colo.

The terms wattmeter and watt-hour meter are by no means synonymous, although unfortunately they have been used rather indiscriminately to designate what is commonly known as the house meter. The wattmeter strictly is not an instrument of this class at all, but it is an instrument whereby the number of watts or kilowatts (thousands of watts) of power used in a circuit or translating device is indicated at any moment. Its reading represents the instantaneous power or rate of doing work. Wattmeters are of two kinds: the indicating wattmeter, in which the reading is shown by the movement of a pointer over a calibrated scale, and the graphic-recording or curve-drawing wattmeter, in which these instantaneous readings are recorded in a continuous line or curve on a chart. Watt-hour meters are instruments that record on a set of dials the amount of electrical energy in watt-hours or kilowatt-hours, that has been consumed in the circuit. To designate them as watt-hour meters is correct and sufficient. However, they are frequently called recording or integrating watt-hour meters. The latter is really the most descriptive and appropriate title for them, as they sum up or integrate the watt-hours consumed.

DIRECT-CURRENT POWER TRANSMISSION.—Can direct current at high voltage be used in power transmission?—S. F., Camden, N. J.

Yes. In France a number of installations using the Thury direct-current system have been operating quite successfully at potentials up to nearly 60,000 volts. In this system a number of series-wound generators are connected in series so that the voltage of the line is the sum of the voltages of the respective generators, although the voltage of each machine is within the safe limit of a commutating machine. The system operates at constant current with a special Thury potential regulator. At the receiving end of the line, or at intermediate substations, corresponding sets of series motors are connected to be operated in series by the line current and to drive separate generators supplying current for the low-voltage distributing lines. This system has not been used in the United States on account of the lower initial cost, higher generating and receiving—apparatus efficiency, simplicity of equipment and operation of the three-phase alternating-current systems generally employed. The direct-current system has a higher efficiency and better characteristics as concerns the transmission line only.

EXCITERS FOR ALTERNATING-CURRENT GENERATORS.—Which is better to use, a shunt or compound machine as an exciter for a three-phase alternator?—M. B. G., Evansville, Ind.

It has become the almost invariable custom to use compound direct-current generators as the exciters for all alternating-current generators. The compound exciter is preferable because it maintains the voltage of the exciting circuit constant regardless of the load on the main generator. A shunt exciter has a tendency to drop in voltage as its load increases; therefore it gives poor regulation of the generating unit, unless it is governed by a regulator of the Tirrill type.

GROUNDED GUARD WIRES FOR TRANSMISSION LINES.—Has the installation of a grounded guard wire over a transmission line been found effective in reducing the disturbances due to lightning?—L. J. K., Waukesha, Wis.

There has been considerable difference of opinion regarding the value of such grounded wires. In many cases barbed wire has been used with the idea that its points would attract the lightning to it. Where barbed wire has been used, however, much trouble from its breaking and short-circuiting the line has resulted. This, combined with the difficulty of handling it, has caused it to be discarded in several instances. Many engineers believe that overhead ground wires are more expensive and troublesome than they are worth. On the other hand, however, there is no reason why such ground wires cannot be securely put up so as to insure that they will not short-circuit the line. Theoretically, they are of unquestionable value and from the experience of some engineers they have been found actually effective in protecting the line.

TRANSFORMER AS A BOOSTER.—We have a one-kilowatt transformer with 2,000-volt primary and 200-volt secondary, the primary of which is connected through a double-pole switch to the generator busbars, and the secondary is connected in series with a 3.5-ampere series incandescent street-lighting circuit to boost the voltage of the same, as the regulator is overloaded. The frequency is sixty cycles and there are about 110 thirty-two-candle-power lamps in series on the circuit. With switch on primary open and 3.5 amperes flowing through the secondary, what voltage is developed in the primary coil? What impedance is offered to the 3.5-ampere current flowing in the secondary coil?—C. G. K., Downers Grove, Ill.

With the primary open and normal current in the secondary there will be developed normal voltage (2,000 volts) in the primary. This voltage, however, will be opposed to that which the generator supplies when it is connected. To force the normal current through the secondary will require the supply of 200 volts across its terminals from the series circuit. The impedance offered to this circuit will be

$$\frac{200}{3.5} = 57.1 \text{ ohms.}$$

It should be noted that the current will not be in phase with the electromotive-force and therefore the power taken by the transformer will not be 200×3.5 watts. It will be desirable, however, to cut the transformer out of circuit when its primary is not connected, as it serves no useful purpose and is merely using up some of the energy supplied to the series circuit.

To Test Improved Wireless Sets.

Both the U. S. scout cruisers, Birmingham and Salem, are now being fitted with what is claimed to be the most powerful wireless system yet devised, and as soon as the apparatus is installed a very extensive test will be made with the ships thousands of miles apart and under all conditions of weather. In this test the battleship Connecticut, Rear-Admiral Schroeder's flagship, and the wireless station at Brant Rock will also take part. Although the orders have not been given out yet, it is thought that the scout cruisers will go across the Atlantic and from some port in Europe will proceed to tropical seas. Anyway, the test calls for the sending of messages over 1,000 miles under any conditions and 3,000 miles under favorable conditions, so that the ships will have to be these distances apart.

The battleship Connecticut now has a fifteen-kilowatt Fessenden set, which it is claimed sends messages over 2,000 miles. On this ship the necessary machinery has been installed in the coal bunkers, and it is thought that such a position is detrimental to its efficiency, since power is lost while getting the current to the masts. The Salem has now a Pierce apparatus of five kilowatts, and it has succeeded in sending messages for 2,000 miles, while the Shoemaker system, which has been placed on the Birmingham, has sent them 1,800 miles.

No American Cable Monopoly.

In a letter to the Earl of Crewe, principal secretary of state for the colonies, the chairman of the Anglo-American Cable Company, B. A. Bevan, of St. Johns, Newfoundland, defends the recent repudiation by the Sir Edward Morris ministry of concessions made by the Sir Robert Bond ministry to the Commercial Cable Company. He says that the concessions would have amounted to a twenty-five-year monopoly of all cable messages passing over the government land lines in favor of the American concern and to the prejudice of the Anglo-American Company, a long-established British corporation.

He reviews the history of the case in detail, setting forth points which he maintains constituted a monopoly in favor of the Commercial Cable Company. It was in the face of these facts, he concludes, that the new ministry of Sir Edward Morris declined to ratify the agreement with the Commercial Cable Company.

$5,000,000 Telephone Company.

Organization of the Home Telephone Company, of Michigan, which succeeds to the business and properties of the Home Telephone Company, of Detroit, and the Interstate Long-Distance Telephone Company, so-called independent concerns, was effected at a meeting at Detroit, August 21. A number of St. Louis (Mo.) capitalists appear in the list of directors. Fred T. Moran, of Detroit, was elected chairman of the board and W. A. Jackson, formerly president of the Michigan State Telephone Company, was elected president. The St. Louis directors are Albert N. Edwards, E. A. Faust, A. W. Lambert, M. F. Bayard, Bliss Michael, Henry Koehler, Jr., E. F. Goltra and Samuel D. Jeffries.

The new company is capitalized at $5,000,000 and contemplates the issue of $10,000,000 first mortgage bonds. It is planned to expend $1,000,000 on immediate extensions.

Seattle Electric Company to Issue $1,150,000 New Common Stock.

Stockholders of Seattle Electric, a Stone & Webster property, will shortly be given the right to subscribe for $1,150,000 common stock at a price to show substantial rights.

Seattle Electric has an authorized issue of $7,500,000 common, of which $5,000,000 is now outstanding, while $1,350,000 is reserved to retire convertible bonds. The balance of $1,150,000 is what is to be issued shortly.

This common stock will be offered for subscription as early as possible after September 15 next, to stockholders of record that date, and in the ratio of one share of new common for each ten shares of common and preferred outstanding.

Holders of convertible bonds who convert into common stock will be given the right to participate in the new issue.

The proceeds realized from the sale of this stock will be used to finance new construction in and about Seattle.

Central-Station Plant for United States Navy Yard.

Advices from San Francisco, Cal., state that work has been commenced at the Mare Island navy yard on the construction of a large central-station power plant building, from which power is to be supplied to all the shops of the big naval station. Such a plant has long been desired by the government officials stationed there, and has been recognized as a necessity.

Bell Telephone, of St. Louis.

The Bell Telephone Company, of St. Louis, Mo., has published a new schedule of rates, effective September 1, which is substantially the same as that of the Kinloch Telephone Company. The Bell makes a reduction of $46.80 a year on the unlimited, direct; $18 on the unlimited direct two-party line, and $6 a year on residence telephones. In explaining this change in the rates, President Walbridge stated that it was made in order to make full use of the company's exchange and wire facilities, which were enlarged previous to the panic. He said his company feels it can easily accommodate 20,000 more patrons and is offering the lower rates as an inducement.

Western Union-American Telephone.

The report of Everett W. Burdett as master in the Western Union-American Telephone case was filed in the United States Circuit Court at Boston on August 21, and shows an award to the Western Union of 20,087.8257 shares of stock in thirty-seven subsidiary Bell companies and $2,579,914 in cash, which is a reduction of 18,101 shares and $3,293,377 in cash from the claim of the plaintiff.

The shares excluded from the accounting were: 5,000 American Telephone and Telegraph Company, 3,895.4 New England Telephone and Telegraph, 200.7 Bell Telephone, of Pennsylvania, 396 Chicago Telephone, and 8,609 shares in various of the companies claimed as a thirty per cent royalty, to which the master ruled the plaintiff had no claim under the famous contract of 1879.

The reduction in the cash claimed by the plaintiff represents the dividends and interest on the shares exempted from the accounting.

The following table shows the claims made by the plaintiff, the amount due on defendant's theory of apportionment and the master's award:

	Plaintiff's Claim.	Defendants Conceded.	Master's Award.
Shares (20%).....	8,188	10,816	20,087
Shares, par value.	$3,496,615	$ 958,703	.....
Total cash.....	5,873,292	1,741,474	$2,579,914
Div. to Apr. 1, '09.	3,489,295	1,036,251	.....
Int. to Apr. 1, '09.	2,315,744	683,904	.....
For franchises....	33,558	10,207	.....
Int. on franchises.	34,694	11,112	.....

Officials of the American Telephone Company have recently expressed opinion that the case is likely to be in the courts for another ten years. Probabilities are remote that the Western Union will collect in the near future $5,000,000 in cash and securities. What is more likely is a compromise and a cash settlement for a substantially smaller amount than the master's findings.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

WARREN & JAMESTOWN STREET RAILWAY.

The report of the Warren & Jamestown Street Railway Company for the quarter ended June 30, 1909, compares as follows:

	1909.	1908.
Total railway operating revenue.	$21,030	$20,965
Total railway operating expense.	8,740	10,074
Net railway operating revenue.	$12,289	$10,891
Taxes accrued	15	492
Operating income	$12,274	$10,398
Total deductions from gross inc.	5,250	6,564
Net corporate income	$ 7,024	$ 3,834

CUMBERLAND TELEPHONE.

The report of the Cumberland Telephone and Telegraph Company for the month of July and seven months ended July 31 compares as follows:

	1909.	1908.
July gross	$ 520,923	$ 500,094
Expenses	302,123	283,473
July net	$ 218,800	$ 216,621
Charges and taxes	41,177	37,347
July surplus	$ 177,623	$ 179,274
Seven months gross	3,701,756	3,557,072
Expenses	2,118,528	2,065,681
Seven months net	$1,583,228	$1,491,391
Charges and taxes	296,998	260,357
Seven months surplus	$1,286,230	$1,231,034

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company for the month of July and ten months ended July 31 compares as follows:

	1909.	1908.
July gross	$ 345,572	$ 326,524
Expenses	180,412	162,413
July net	$ 165,161	$ 164,111
Charges	49,883	49,345
July surplus	$ 115,278	$ 114,765
Ten months gross	3,137,547	2,999,288
Expenses	1,894,815	1,814,428
Ten months net	$1,242,731	$1,184,859
Charges	359,775	368,908
Ten months surplus	$ 882,957	$ 815,951

NORTHERN OHIO TRACTION.

The report of the Northern Ohio Traction and Light Company for the month of July and seven months ended July 31 compares as follows:

	1909.	1908.
July gross	$ 227,012	$ 200,392
Expenses	115,650	105,377
July net	$ 111,361	$ 95,015
Charges	43,391	44,052
July surplus	$ 67,970	$ 50,963
Seven months gross	1,200,953	1,038,136
Expenses	669,016	623,035
Seven months net	$ 531,938	$ 415,101
Charges	306,711	307,950
Seven months surplus	$ 225,227	$ 107,151

BIRMINGHAM RAILWAY, LIGHT AND POWER.

The report of the Birmingham Railway, Light and Power Company for the month of July, 1909, compares as follows:

	1909.	1908.
July gross	$183,186	$170,261
Expenses	101,974	99,775
July net	$ 81,212	$ 70,486

AURORA, ELGIN & CHICAGO.

The report of the Aurora, Elgin & Chicago Railroad Company for the month of July, 1909, compares as follows:

	1909.	1908.
July gross	$167,614	$148,748
Expenses	77,895	72,208
July net	$ 89,719	$ 76,540
Charges and taxes	28,899	27,778
July surplus	$ 60,820	$ 48,762

LONDON UNDERGROUND.

The Underground Electric Railways of London report operations for the week ended August 7 and for thirty-one weeks ended August 7, 1909, as follows:

	1909.	1908.
Bakerloo	£ 2,770	£ 2,650
Piccadilly	4,430	4,480
Hampstead	3,695	3,515
District	8,780	8,220
Tramways	8,950	10,767
Total	£ 28,625	£ 29,632
Bakerloo	£102,290	£ 93,630
Piccadilly	176,810	166,210
Hampstead	120,305	101,205
District	308,441	278,618
Tramways	187,490	207,566
Total	£895,336	£847,229

TOLEDO RAILWAYS AND LIGHT.

The report of the Toledo Railways and Light Company for the month of July and seven months ended July 31 compares as follows:

	1909.	1908.
July gross	$ 226,564	$ 199,237
Expenses	134,221	111,665
July net	$ 92,343	$ 87,572
Other income	267	91
Total income	$ 92,610	$ 87,663
Charges and taxes	75,506	71,751
July surplus	$ 17,104	$ 15,912
Seven months gross	1,528,054	1,429,612
Expenses	884,406	794,054
Seven months net	$ 643,648	$ 635,558
Other income	1,363	2,874
Total income	$ 645,011	$ 638,887
Charges and taxes	501,075	491,887
Seven months surplus	$ 143,936	$ 146,545

INTERBOROUGH RAPID TRANSIT.

The Interborough Rapid Transit Company reports to the New York Stock Exchange for the year ended June 30, 1909, which compare as follows:

	1909.	1908.
Gross	$25,775,392	$24,059,299
Expenses	10,747,443	10,722,694
Net	$15,027,949	$13,336,605
Other income	1,384,644	1,220,170
Total income	$16,412,593	$14,556,775
Deductions:		
Bond interest and rents	$ 5,810,750	$ 5,069,650
Taxes	1,799,807	1,586,466
Amount debt, discount, etc.	12,213	.....
Total deduction	$ 7,622,770	$ 6,656,116
Balance	8,789,823	7,900,659
Manhattan Ry. guarantee	4,200,000	4,200,000
	$ 4,589,823	$ 3,700,659
Dividends, nine per cent.	3,150,000	3,150,000
Surplus for year	$1,439,823	$ 550,659
Previous surplus	1,831,743	.....
Surplus	$ 3,271,566	.....
Net adjustment of items of prior period	278,121	.....
Profit and loss surplus June 30	$ 2,993,445	$ 1,831,743

BROOKLYN RAPID TRANSIT COMPANY.

The Brooklyn Rapid Transit Company has issued its annual report for the year ended June 30, 1909. The income account compares with former years as follows:

	1909.	1908.	1907.
Gross	$19,694,462	$19,870,566	$19,381,587
Expenses	11,394,655	11,939,578	11,465,705
Net	$ 8,299,807	$ 7,930,988	$ 7,915,882
Other income	605,817	677,824	555,166
Total income	$ 8,905,625	$ 8,608,812	$ 8,471,048
Charges and taxes	6,969,015	6,534,938	6,026,387
Balance	$ 1,936,609	$ 2,073,873	$ 2,444,661
Addition and betterment	65,430	229,781	442,062
Surplus	$ 1,871,179	$ 1,844,092	$ 2,002,598
Judgment recov.	.....	.....	39,798
Surp. for year.	$ 1,871,179	$ 1,844,092	$ 2,042,396
Previous surplus.	3,853,460	3,734,086	2,075,563
Total surplus.	$ 5,724,639	$ 5,578,098	$ 4,117,959
Disc. on bonds	89,575	1,457,173	371,825
Balance	$ 5,635,064	$ 4,120,925	$ 3,746,134
Reserve, expenses and losses	†342,031	*250,835	.....
Balance	$ 5,293,033	$ 3,870,090	$ 3,746,134
Dividends	897,076	.....	.....
Balance	$ 4,395,957	$ 3,870,090	$ 3,746,134
Old account adj.	8,727	16,630	12,127
Profit and loss surplus	$ 4,387,230	$ 3,853,460	$ 3,734,007

*Depreciation in securities.
†Includes $238,457 for reserve account, special franchise and real estate taxes in litigation; $20,197 for expenses adjusted prior to June 30, 1908, and $83,376 due to losses by change of line, etc.

Brooklyn Rapid Transit earnings and operating expenses in detail for the past three years compare as follows:

	1909.	1908.	1907.
Passengers	$19,058,693	$18,930,164	$18,443,983
Freight, mail and express	254,643	315,719	349,539
Advertising	155,860	155,205	148,424
Am. Ry. Tr. Co.	225,266	469,478	439,641
Total	$19,694,462	$19,870,566	$19,381,587
Operating expenses:			
Maintenance way and structure.	$ 1,194,014	$ 1,020,104	$ 860,075
Maintenance of equipment	1,690,916	1,837,550	1,786,731
Operating power plant	1,596,759	1,653,727	1,655,400
Operating cars	4,812,556	4,979,756	4,803,320
Am. Ry. Tr. Co.	155,702	363,524	365,863
Damages and legal expenses.	1,129,396	1,242,361	1,126,248
General expenses	676,666	651,669	643,399
Freight, mail and express	138,644	190,885	233,667
Total	$11,394,655	$11,939,578	$11,465,705

The comparative statement of results of operations for the years ending June 30, 1909 and 1908, shows total earnings from operation of $19,694,462 for the year 1909, and $19,870,566 for 1908. The decrease of $176,104 in gross earnings is distributed as follows:

Passenger earnings	Inc.	$128,529
Freight earnings	Dec.	40,125
United States mail earnings	Inc.	645
American Express Co. earnings	Dec.	21,596
Advertising	Inc.	656
American Railway Traffic Company	Dec.	244,213

The falling off in freight is explained by general depression in business. The last six months of the fiscal year, however, show an increase over the corresponding period of 1908. The decrease in express is due to the contract with the American Express Company expiring on December 31, 1908, and not renewed; the decrease

in the American Railway Traffic Company of $244,213 is due to contract with the city expiring December 27, 1908, and not renewed.

The influence of the business depression on passenger earnings, noted in the last annual report, continued to the end of the last calendar year, and resulted in a deficit in gross passenger receipts of $358,479 for the six months (July to December, 1908, inclusive), but beginning with January of this year passenger earnings showed an increase, which at the close of the six months ending June, 1909, amounted to $487,000, or 5.4 per cent, overcoming the decrease of $358,479, and closing the fiscal year with an increase of $128,528.

The total cost of operation for the year ending June 30, 1909, was $11,394,655, as against $11,939,579 for the previous year, a decrease of $544,924, or 4.56 per cent.

The net income from operation increased $368,819, or 4.65 per cent.

Taxes show an increase of $407,613, or 43.83 per cent.

Interest and rentals show an increase for the fiscal year of $26,464, or less than one-half of one per cent.

Surplus earnings after making all deductions were $1,871,179, an increase of $27,087, or 1.47 per cent, over the preceding year.

An official of the Brooklyn Rapid Transit Company explains that the decrease of $164,351 in the amount charged out of net income for betterments and additions to the property during the year 1909 is due to the fact that there has been a revision of the accounts of the company, whereby a large proportion of the money so expended has been charged against operating expenses. He says that, whereas the income account shows a decrease in this item, as a matter of fact there was an actual increase over 1908 of somewhere in the neighborhood of $190,000.

DETROIT UNITED RAILWAYS.

The report of the Detroit United Railway Company for the month of July and seven months ended July 31, 1909, compares as follows:

	1909.	1908.
July gross	$ 771,453	$ 679,447
Expenses	466,319	*417,869
July net	$ 305,134	$ 261,577
Other income	12,670	6,462
Total income	$ 317,804	$ 268,039
Charges and taxes	162,050	135,978
July surplus	$ 155,754	$ 132,061
January 1 to July 31:		
Seven months gross	$4,410,512	$3,964,875
Expenses	2,717,679	*2,528,176
Seven months net	$1,692,833	$1,436,698
Other income	83,750	35,072
Total income	$1,776,583	$1,471,770
Charges and taxes	1,088,384	948,952
Seven months surplus	$ 688,199	$ 522,818

*Includes taxes.

UNITED ELECTRIC SECURITIES COMPANY.

The United Electric Securities Company reports for six months ended August 1, 1909, total profit, after deducting $131,306 for expensees and interest on its own collateral trust bonds, of $211,016. From this was paid dividends on the preferred and common stocks amounting to $160,000, leaving surplus for the six months of $51,016. This amount, together with the previous surplus on February 1, 1909, of $1,265,062 makes total surplus August 1, 1909, of $1,316,079.

CHICAGO RAILWAYS.

Passenger earnings of the Chicago Railways during June were $1,021,608, against $911,030 a year ago. July earnings were $1,046,723, against $937,401 a year ago.

General Electric's Earnings Helped by Steadiness of Prices.

Net earnings of the General Electric Company are being materially benefited this fiscal year by the return of prices to more nearly the normal standard.

During the fiscal year ended January 31, 1909, prices were cut right and left. This cutting in prices was indulged in by all the electrical companies, and was due not only to the competition for business on a diminishing volume of new orders, but also to the desire to tempt buyers into the market by reason of the very favorable terms offered.

Since March 1 the bulk of electrical orders coming to hand has been sufficient to warrant a gradual increase in prices, and at the present time average prices for electrical apparatus are estimated as ten per cent higher than eight months ago.

Some departments of the General Electric Company's plants are already overcrowded with orders and in others, such as the street-railway department, the outlook favors a normal volume of business by fall.

There is no question that General Electric will fully earn its eight per cent dividend this fiscal year, with a substantial surplus to spare.

Directors have not made any move in the direction of building the new plant projected at Erie, Pa., in the early part of 1907, and the plant will not be constructed until the need for it is more urgent than at present.

Delay in New Code Rule.

The Western Union and Postal Telegraph companies have decided to postpone the enforcement of a recent order restricting the length of telegraph code words, except in the case of ordinary dictionary words, to five letters. This decision is the result of numerous protests received by the companies from business organizations, notably the National Association of Manufacturers, of which John Kirby, Jr., is president.

The association's board of directors considered the new order of the telegraph companies of such importance to the 3,000 manufacturers forming the association that the board recently adopted a series of resolutions strongly protesting against the date, September 1, as selected by the telegraph companies for the enforcement of the new order.

President Clowry, of the Western Union, and Vice-President Bruch, of the Postal, have therefore agreed to a postponement until December 1. These decisions will give the business interests of the country at least three months in which to prepare for the change.

Yerkes Estate Receivership.

The United States Circuit Court of Appeals has confirmed the action of Judge Ward, of the Circuit Court, in appointing and continuing Harrington Putnam as receiver of the estate of the late Charles T. Yerkes. The receiver was appointed in a general creditors' action for the administration and distribution of the estate instituted by the Underground Electric Railways Company, of London, Limited. The appeal was taken by Louis S. Owsley, executor of the Yerkes will, and Mary A. Yerkes, the widow.

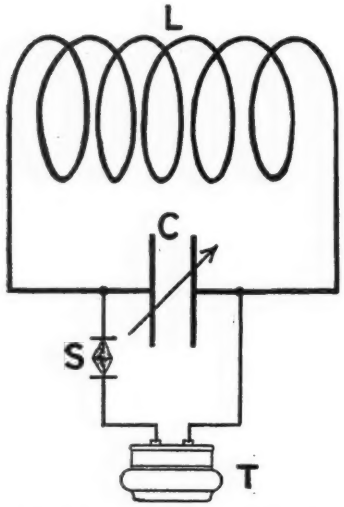
Attach Waterpower Rights.

Water rights belonging to the Sierra Nevada Water and Power Company, one of the properties of the insolvent Market Street Bank, of San Francisco, Cal., have been attached by the sheriff of Calaveras County to satisfy a judgment amounting to $10,562. The water rights affected include 20,000 inches in the South Fork of the Mokelumne River, 20,000 inches in the Middle Fork of the same river and 30,000 inches at another point in the South Fork.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

A PORTABLE WAVEMETER.

The new Marconi wavemeter is a light, portable instrument containing a vibratory and a detector circuit with telephone, of small dimensions and weighing less than three pounds. The vibratory circuit consists of a fixed inductance and a gradually adjustable condenser; its damping is very small. The detector circuit is connected across the condenser and comprises a telephone receiver in series with a carborundum crystal. The wave-lengths of the vibrations taking



THE MARCONI WAVEMETER.

place in a circuit are measured by approaching the wavemeter to this circuit and adjusting it to resonance which is attained when the sounds in the telephone are loudest. The wave-lengths may be ascertained from the position of the condenser and a graduated scale or a table. The exactness of the instrument is due to the fact that the entire vibrating circuit remains fixed and also that the detector is not in the vibrating, but in a parallel, circuit, the resistance of which is so high that it scarcely influences the vibrating circuit. The great sensitiveness of carborundum is also of value in this respect. The accompanying illustration is a diagram of the circuit connections of the apparatus, in which L is the inductance, of about fifteen micro-henrys, capable of furnishing all wave-lengths from 180 to 750 metres. It is wound on a square form and placed in the cover of the instrument case, so that it can be easily exchanged and replaced by inductances of different values. C is the adjustable condenser, S a spring clamp holding a small carborundum crystal, and T the telephone receiver.—*Translated and abstracted from Elektrotechnischer Anzeiger (Berlin), July 29.*

AN INTERESTING INSTALLATION QUESTION

Quite recently a municipal central-station engineer had before him alternative tenders for a reciprocating and turbine plant of 500 kilowatts. He could have purchased a turbo set which would have consumed less steam, but, in view of the fact that within a year or two a further small addition to this plant would be required, his final recommendation, adopted by the committee, was that a reciprocating set should be ordered, together with a suitable condenser for accommodating an exhaust turbine, the installation of which in the early future would reduce the rate of steam consumption below the figures guaranteed in the present instance for either the reciprocator or turbine. This appears to be the first case in which the development of the exhaust turbine has actually enabled reciprocating engine makers to obtain a contract in competition with the live steam turbine. It is not an example that will be followed by larger stations, but such practice might have an important bearing on the commercial survival of numerous public and private generating plants.—*Abstracted from The Times (London), Engineering Supplement, August 18.*

A NEW SOLUTION OF THE PROBLEM OF TRANSMITTING PHOTOGRAPHS.

The apparatus recently invented by Laurent Sémat represents a simple solution of the problem of transmitting handwriting, drawings, photographs, etc., to a distance. The difficult problem of obtaining synchronism between sending and receiving stations has been solved in an ingenious and simple manner. The sending cylinder is of smaller diameter than the receiving cylinder, but both are of the same length, if the picture is to be reproduced in the original size. A sheet of metal foil, on which the picture to be transmitted has been drawn or printed, is wound on the thinner sending cylinder, covering its entire surface. A stylo bearing on the foil sends current impulses into the line, by means of which the picture is reproduced, the circuit being closed when the stylo is in contact with the foil, and opened when it passes over the blackened parts. A sheet of carbon paper, and over the same a sheet of ordinary paper, is wound on the larger receiving cylinder. Assuming the difference in the circumference of the cylinders to be one-eighth, then the reproduced picture must cover only seven-eighths of the surface of the larger cylinder. The relations in the speed between the two cylinders are such that the smaller one will perform one revolution in seven-eighths of the time required by the larger one. Furthermore, the former stops after each revolution and starts again when the larger one has moved the distance of one-eighth of its circumference left free by the picture. This operation is repeated at each revolution. By starting at the same point equal surfaces of both cylinders will pass under each stylo during the same time interval, the lateral displacement on both cylinders being the same, when reproducing pictures in original size. The advantages of Sémat's apparatus consist in the simplicity and perfection of the synchronizing arrangement. Furthermore, no selenium or photographs are used, and all operations take place in daylight by means of mechanical devices. The instruments may be connected to ordinary telegraph or telephone lines, and a picture seven by twelve centimetres in size can be easily transmitted in five minutes. The apparatus was shown at the recent annual exhibition of the French Physical Society.—*Translated and abstracted from Elektrotechnischer Anzeiger (Berlin), August 1.*

ELECTRICALLY DRIVEN CONVERTER BLOWER IN A ROLLING MILL.

The Thomas process for the manufacture of malleable and rollable cast-iron requires for its operation large quantities of air at comparatively high pressures. The stopping of the air current, even for an instant, means danger of burning out the converter bottom, and for this reason reliably running steam engines

have been employed exclusively for driving converter blowers until recently. The first electrically driven blower has been installed by the A. G. Peiner Rolling Mill. Polyphase current at 10,000 volts is obtained from a distant power station and transformed into direct current of 520 volts. The direct-current sides of the converter work in parallel with two storage batteries having a capacity of 2,000 and 4,000 amperes for one hour, respectively. The batteries serve for compensating load variations caused by the motors driving the rolling mill and also as a momentary reserve in the case of failure of the current supply from the transmission line. The twin-blower is capable of delivering 800 cubic metres of air per minute at a pressure of about two atmospheres when running at a speed of eighty revolutions a minute. As a regulation of forty to eighty revolutions per minute in shunt was required for the machine, the Felten & Guilleaume-Lahmeyer Works built a shunt motor with reversing poles for 500 volts with a permanent load capacity of 2,000 horsepower. Another condition was that the degree of variation in the air supply should not be more than 1:30 at fifty revolutions per minute. This required a great rotating momentum, which was provided by making the armature of large diameter, and the necessity of a special flywheel was thus circumvented. In order to carry out this construction of a so-called flywheel machine a considerable number of poles and a magnet frame of large diameter were necessary. The outside diameter of this frame is 6,300 millimetres, and the machine is probably one of the largest direct-current motors ever built.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), July 22 and 29.*

THERMAL AMMETER FOR CURRENTS OF GREAT INTENSITY AND HIGH FREQUENCY.

Prof. A. Broca formerly measured these currents by means of an exact electro-dynamometer. This method was inconvenient, and he constructed a new thermal ammeter, which was described by him in a lecture before the Société Internationale des Electriciens. Ten horizontal wires are stretched between two vertical plates, the wires forming the edges of a regular prism and the whole having the appearance of a squirrel cage. Connection for the current is made in the center of the two plates, and by reason of the symmetrical arrangement the current divides itself uniformly between the wires. By measuring the expansion of one of them in the usual manner an apparatus is furnished for a capacity of fifty amperes, if each wire can withstand five amperes. There is no induction between any two adjacent wires, as they act in an inverse sense. A variable sensitiveness is obtained by combining symmetrically a different number of wires. It has been ascertained that the multiplying power is the same as with direct current. An inconvenience is the changing of the zero when the instrument is used with ten wires for fifty amperes, on account of the central bronze column, which has the same coefficient of expansion as the wires, but cools at a different rate. This effect, which amounts to four to five per cent, attains its maximum value in about ten minutes. It could be avoided by using insulating material, but then the zero would vary with the exterior temperature. However, in place of having a cause of error of unknown value, it has been considered preferable to retain this imperfection in the apparatus and to have an error of definite value. By blackening the metallic parts in order to increase the heat radiation, and by insulating the central column from the end plates with mica, the effect has been decreased, and the indications of the instrument are correct within two per cent. Ammeters for currents of any intensity may be constructed on this principle by increasing the number of wires and the size of the plates.—*Translated and abstracted from Bulletin de la Société Internationale des Electriciens (Paris), for July.*

SILUNDUM AS A HEATING MATERIAL.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for May 15, 1909, an account was given of the manufacture of silundum, a new product of the electric furnace. This article shows its use as a heating element. The comparatively low efficiency of the radiant-heat electric radiator and the cheerlessness of the ordinary black electric radiator have long been realized. As a means of heating a room the electric radiator has so far only been a partial success; it is either cheerful and inefficient, as in the case of a luminous radiator, or cheerless and efficient, as in the case of a non-luminous radiator, and between the two there is not much to choose. For cooking purposes electricity occupies a distinctly more favorable position; its efficiency is unquestioned, as much as ninety-seven per cent of the energy supplied to an electric kettle or similar vessel reaching the contents, and in this respect it has no rival at all, even if such appliances did not have the collateral advantages of cleanliness, portability and freedom from the risk of fire. Many efforts have been made to produce a more or less refractory material which would, while giving all the advantages of existing electric heaters, prove an efficient radiator and give the much-desired cheerful glow. The electric furnace has now produced a material which is beginning to be known commercially as silundum, which can be heated in the atmosphere to a temperature of 3,000° Fahrenheit without entering into any combination with oxygen nor apparently losing any of the electrical or physical properties which are so valuable. It appears impossible to melt it; it is therefore truly refractory, and it will withstand the attacks of acid and is unaffected electrically by water. The material is produced in rods, bars, sheets or other suitable shape, and is used for electric stoves, radiators, grills, toasters, and cooking purposes generally, for the work can be done over a bright red or even incandescent material, just like a bright coal or coke fire. For cooking, such a material cannot approach the resistance methods now so common, because of the great heat dispersion into the surrounding atmosphere; but for many purposes, where a glow combined with a high temperature is desirable, the new material will prove invaluable. No reliable information as to the composition of silundum is yet available, but the foregoing information is sufficient to indicate that the new material will prove of very great value for many purposes.—*Abstracted from The Engineering Review (London), for August.*

Youngest Town in the Country Has Electric Light and Power Plant.

The little town of Luzon, Wash., sixty miles west of Pasco, on the S. P. & S. Railroad, has the distinction of being the youngest town in the country which is lighted with electricity.

The town is now but five months old, the plats having been filed on April 5, 1909. During the intervening time a power plant has been installed, consisting of a 125-horsepower Smith gas producer, and a 120-horsepower Riverside gas engine, directly connected to an eighty-five-kilowatt Western Electric generator. The plant is now also being used to pump water for irrigation.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The Elliott Mechanical Stoker.

The Elliott mechanical stoker, illustrated herewith, not only performs the function of automatic stoking, but in addition grinds up the fuel, regulates the feed of the coal to the furnace, distributes it over the grate surface, and finally removes the ashes from under the grate.

Fig. 1 illustrates two of these stokers side by side, the one on the right (to which the following description applies) having parts of the casing removed to show the mechanism. In the middle, at the top, is shown the crusher and regulator, to which coal is fed from a storage bin over the boiler. The rate of operation of this device (and simultaneously of the worm conveyor mentioned later) is governed by the change gear to the right, which is regulated by the hand wheel just above it. The crushed coal passes from the crusher and regulator on either side and is forced along by the worm conveyors (shown half uncovered in Fig. 1) to the rotary turbine devices, one at each end, by which it is distributed to the delivery chutes underneath the latter, and which are shown protruding from the faceplates in Fig. 2.

The passage of the coal is assisted by means of two steam jets, one-thirty-second of an inch each in diameter, in the base of the turbines, a three-eighths-inch steam pipe supplying both jets.

The worm conveyor is driven by a noiseless chain belt, and the shaft across the front of the stokers may be coupled to as many stokers in line as may be desired.

Fig. 3 shows the front of a complete installation in which the two stokers are driven by an electric motor belt-connected to the driving shaft. This particular view is from a photograph of two boilers at the plant of the Ridgway Dynamo and Engine Company, Ridgway, Pa., the complete plant of four boilers being now equipped with Elliott stokers. The first pair was installed in August, 1907.

Fig. 2 gives a good idea of the grate mechanism. The grates incline downward to the center at an angle of sixteen degrees. They are actuated by the gearing shown uncovered in the bottom of Fig. 1, which provides a slow oscillating movement designed to remove the ashes, stir the fire to prevent coking, and ventilate the burning fuel. When extremely poor fuel is used, the clinker and refuse can be dumped, if desirable, through the two center grates by means of the hand lever shown to the extreme left in the lower part of Fig. 1, and at all other times these "dump grates" oscillate in unison with the balance of the grates.

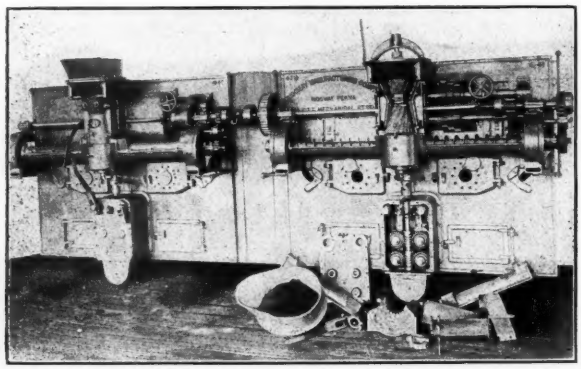


FIG. 1.—ELLIOTT STOKER—FRONT VIEW WITH PARTS OF CASING REMOVED.

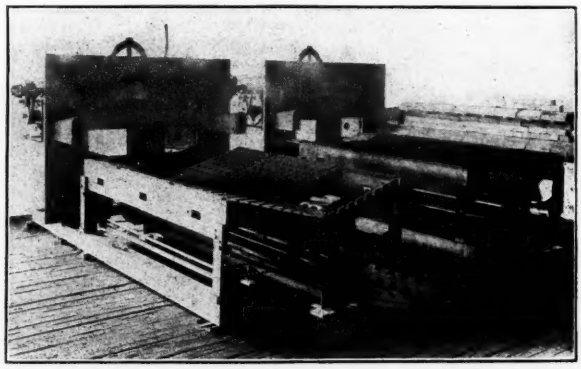


FIG. 2.—ELLIOTT STOKER—BACK VIEW, SHOWING GRATES, WORM CONVEYOR, ETC.

This stoker, which is made by the Ridgway Manufacturing Company, Ridgway, Pa., has proved very successful in operation, and is remarkable for its continued reliability under the severest condition of service.

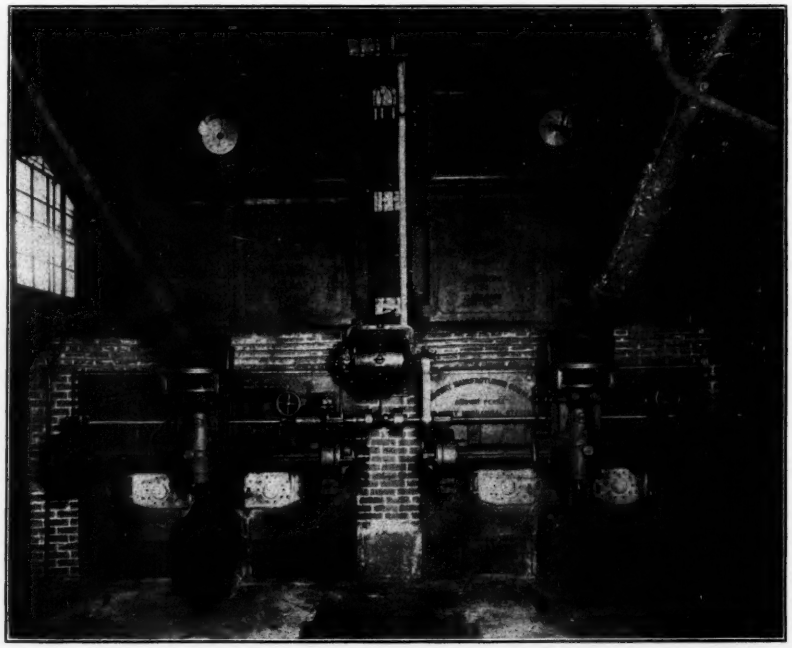


FIG. 3.—ELLIOTT STOKERS AT THE PLANT OF THE RIDGWAY DYNAMO AND ENGINE COMPANY, RIDGWAY, PA.

The Middleton Magnetic Fault Finder.

The exact location of faults in lead-covered high-tension and other multiple-conductor cables is frequently rendered very difficult by the well-known loop methods involving resistance measurement. Thus a proper loop can sometimes not be obtained, as all three phases may be burned and "shorted" together, or one of the wires burned in two and grounded at one end, or the wire may be damaged due to the burn, so that its resistance is not in proportion to its length, or there may be more than one fault on a conductor. In cases of this kind it has been the laborious custom to explore the entire cable with a magnetic compass or to keep cutting it until the fault is found.

A much simpler, quicker and less expensive method for such fault location has been devised by W. D. Middleton, of Chicago. It is the result of extended experience in telephone work and is particularly adapted to power and high-tension cables, although it is of general service for telephone, telegraph and signal cables as well. The apparatus has been called the Middleton Magnetic Fault Finder. Its operation is as follows:

An alternating current of sharp wave form is sent along the faulty conductor and listened to with a special current transformer in series with a pair of telephone receivers. The listening transformer is held close to the cable at different points and the alternating current in the faulty wire noted.

The listening transformer is unique in that its magnetic circuit is so arranged that it receives such a predominating influence from the faulty wire that the return current has little neutralizing effect. The magnetic circuit encompasses about one-third of the circumference of an underground cable. See Fig. 2.

If the magnetic circuit went around the cable and all the alternating current in the faulty wire should return over the sheath, the effect on the coil connected to the receiver would be exactly neutralized, and no sound would result. If the current returns over the sheath, it acts apparently as a wire at the center of the cable. The center of the cable being at a greater distance from the air gap than the faulty wire, one hears the sound set up till the fault is reached.

When the current returns over an adjacent wire as over one of the other phases in the case of a cross, at times one of the phases will be closer to the air gap than the other and at other times they will be exactly the same distance and again the second phases will be the closer. The current will be heard except where the phases are the same distance away.

The party listening may stand at the top of the manhole while the assistant applies the transformer at two or three points along the cable, where it is exposed. Time may be saved by starting a man at each end of a long cable, each listening every few blocks. It is not necessary to take the tiling off a high-tension cable, as the noise can be heard several inches away. Where it is possible to get on all sides of the cable, a location can be made within two or three inches, if the trouble is not between manholes, otherwise within three feet, or half of the lay of the cable.

A double receiver is used, one on each ear, with ear cushions to shut out street noises. A great variety of noises are heard from the cables. On this account it is necessary to make the interrupter give out a tone that is distinguishable from any of the other noises. To this end a multiple electrolytic interrupter is used. One of the tubes gives a high frequency, which is automatically interchanged with the low frequency of the other tube. This gives a distinctive noise.

If the cross or ground is a high-resistance one, it must be brokn down till it is possibile to put fifteen or more amperes on the conductor, so that the sound in the receiver may be amply large. For this purpose the transformer is made adjustable, so that several voltages may be obtained, and long or short, large or small cables may be tested with the same efficiency.

The apparatus is generally furnished in duplicate, so that there will absolutely be no interruption to the current to which the party testing is listening at different points. This apparatus for locating troubles has been in use in Chicago with great success. It is manufactured by Middleton Brothers, 1361 Monadnock Block, Chicago; and a patent for it has been applied for.

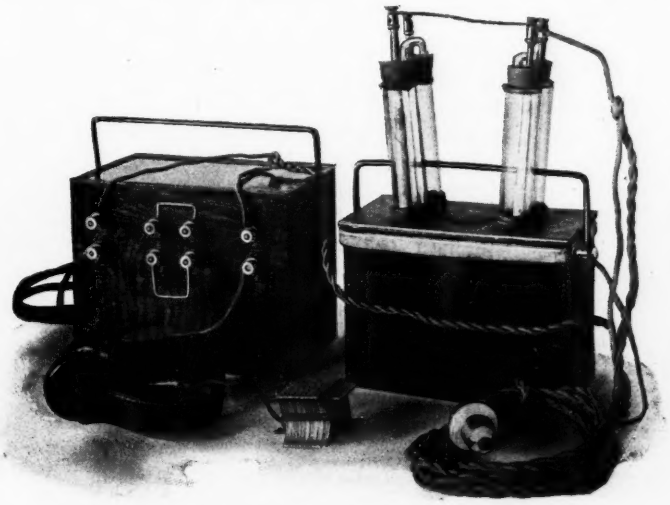


FIG. 1—THE MIDDLETON MAGNETIC FAULT FINDER.

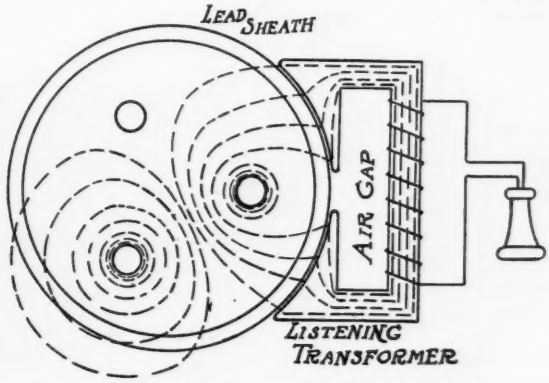


FIG. 2—APPLICATION TO THREE-PHASE CABLE.

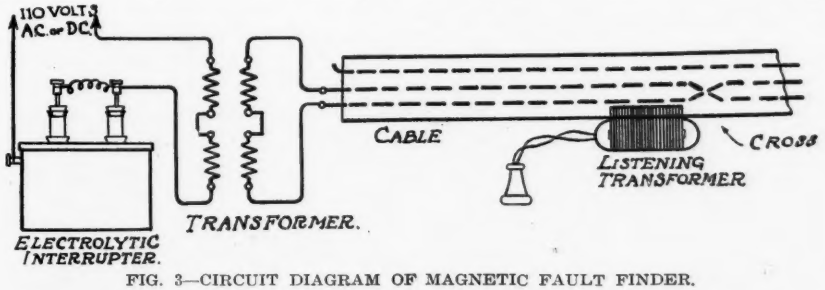


FIG. 3—CIRCUIT DIAGRAM OF MAGNETIC FAULT FINDER.

The Westinghouse Core-Loss Voltmeter.

An instrument which makes possible the accurate measurement of the core loss of distributing and power transformers, regardless of wave-form distortion or frequency variation, should be a valuable adjunct to a central station's testing department. Such an instrument is the core-loss voltmeter, described and illustrated herewith, which is manufactured by the Westinghouse Electric and Manufacturing Company.

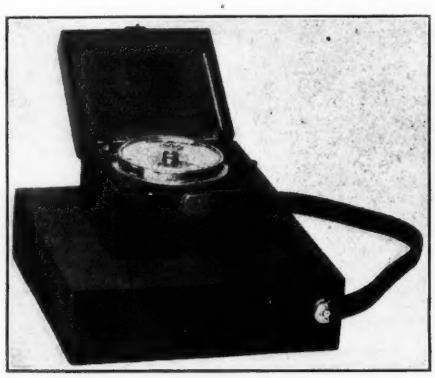
The correct measurement of transformer losses is perhaps the most difficult and yet the most important test which the central station has to perform. The inaccuracies in such tests result from many causes, such as frequency, temperature and wave-form variations, inaccurate wattmeters on low power-factors, wrong meter connections, etc. Of all these the wave-form variations are the most serious. These are almost always present on ordinary commercial circuits and are the most difficult to make corrections for readings taken on ordinary instruments. A peaked voltage wave will cause a lower core-loss, and a flat wave a higher core-loss, than a sine wave of the same effective voltage.

Since guarantees of transformer core losses are generally based on a sine wave of electromotive-force, it is necessary that some method be employed to secure a sine wave shape or its equivalent, when testing transformers for the performance guaranteed. The equivalent loss due to a sine-voltage-wave at a normal frequency of, say, fifty cycles, can be secured under normal conditions of wave form and frequency by either lowering or raising the voltage. What is needed then is an indicator which will enable a voltage adjustment to be made to give a core loss equivalent to that produced by a sine wave at normal frequency and voltage. To render such an adjustment possible the core-loss voltmeter has been designed.

This meter consists essentially of a ring or core of laminated steel excited by a winding, and a wattmeter of suitable design on which to read the power input to the ring and all copper circuits in the instrument. The core and winding are mounted in the lower case with the two leads of the winding brought through the top and into the instrument case which contains the meter movement. A stationary current coil is connected in series with the winding. The shunt circuit consists of a moving coil, a non-inductive resistance and a compensating coil all in series across the instrument terminals. The compensating coil is wound parallel to the stationary current coil and has the same number of turns. The deflection of the wattmeter movement is caused by the total input of the instrument which consists of the hysteresis and eddy loss in the ring, or magnetic rheostat, and the I^2R losses in the copper circuits of the instrument.

The instrument is calibrated in parallel with an alternating-current voltmeter on a pure sine-voltage-wave of the required frequency from a small smooth-core alternator and the scale is drawn in to agree with the alternating-current instrument. Two scales are provided, one reading watts input of the instrument itself and the other volts.

In application the core-loss voltmeter is connected across the terminals of the transformer under test, in the same manner as an ordinary voltmeter. A watt-



WESTINGHOUSE CORE-LOSS VOLTMETER.

meter is also connected in the circuit in such a way as to measure total input of both transformer and core-loss voltmeter. The voltage of the circuit is then adjusted by any convenient means until the voltmeter reading is the same as the normal voltage of the transformer. The total power input is then read on the wattmeter and the watt input of the instrument read on the watt-scale of the core-loss voltmeter, the difference being the core-loss of the transformer.

The core-loss voltmeter may be used as a portable voltmeter in testing transformer core losses on any reasonably distorted wave of voltage and without any knowledge of the wave form.

There are many advantages which will result from the use of the core-loss voltmeter. Chief among these is the comparative simplicity in testing equipment since very little apparatus is required and no oscillograph is needed to determine the form factor. Another advantage is that transformers need not be tested at the source of power. Competitive tests are also very much simplified when the core-loss voltmeter is used, because there is no need of having similar conditions of wave form, frequency, etc., for each transformer tested.

The illustration shows the core-loss voltmeter as at present constructed. A new style of instrument is being made up which is more compact than the one shown. This new design will have the meter element mounted in the center of the core instead of above it. A line of double-scale voltmeters is also being manufactured which combines in one instrument the advantages of a high and low reading voltmeter.

Twenty-four-Hour Service at Appleton, Minn.

In the latter part of 1905 it was deemed advisable to maintain a twenty-four-hour service at the electric plant in Appleton, Minn., but it was found that the cost of operating the generating unit during the day would be prohibitive. The management consequently installed, in January, 1906, a battery of Chloride Accumulators, manufactured by the Electric Storage Battery Company, of Philadelphia, Pa. This battery consisted of 128 cells, with a capacity of twenty-five amperes for eight hours.

A careful comparison of the records of this plant for the year preceding and the year following the installation of the battery was kept. This comparison showed that the installation of the battery effected an increase of fourteen per cent in the gross receipts of the company. Notwithstanding this increase in the output of the plant, the fuel actually consumed in 1906 was somewhat less than that used in 1905.

The comparison further showed that after allowing the proper interest and maintenance charges on the battery equipment, a net return on the investment was shown of approximately fourteen per cent. It should be noted that this was the return effected by the battery in the first year of its service. At that time sufficient business had not been acquired to call for the complete output of the battery; as this business, however, has grown to a considerable extent since then, the net return during 1907 and 1908 has naturally been greater.

By being in a position to offer its customers light and power at any time, the Appleton plant has been able to increase the number of its customers as well as the actual plant output.

Wagner Generators and Synchronous Motors.

The Wagner Electric Manufacturing Company, St. Louis, Mo., manufactures belt-driven generators, of the type illustrated herewith, in all sizes from sixty to 400 kilowatts, for any desired frequency, and for all the usual voltages. These generators are of the split-bearing type, permitting examination and repairs of the journals without disturbing the rotor. The field coils are wound with square wire in the smaller sizes, and with flat strip, wound edgewise, in the larger sizes. Considerable overexcitation may be resorted to when desired.

The journals have in all cases two oil-ring slots or spaces, but only one ring per slot, thus preventing jamming of the rings, while insuring a uniform and constant flow of oil. The construction is such that leakage of oil into the windings is entirely prevented.

The chief features to be taken into account in designing alternating-current generators are: (1) Capacity; (2) wave form; (3) regulation; (4) efficiency; (5) ability to operate in parallel with other generators.

In addition to the normal kilowatt capacity and the temperature rise under normal operating conditions, notice must be taken of possible overload capacity and the corresponding temperature rise.

The ideal wave form is the so-called "true sine wave." The losses in all secondary apparatus are slightly lower with the so-called peaked form of wave. For the same effective voltage, however, or indication upon the voltmeter, the top of the peak will be much higher, thereby submitting the insulation to that much greater strain. The slight saving in the losses of secondary apparatus, obtained with peak wave, by no means compensates for the increased insulation strains, and a generator having true sine wave should always be preferred.

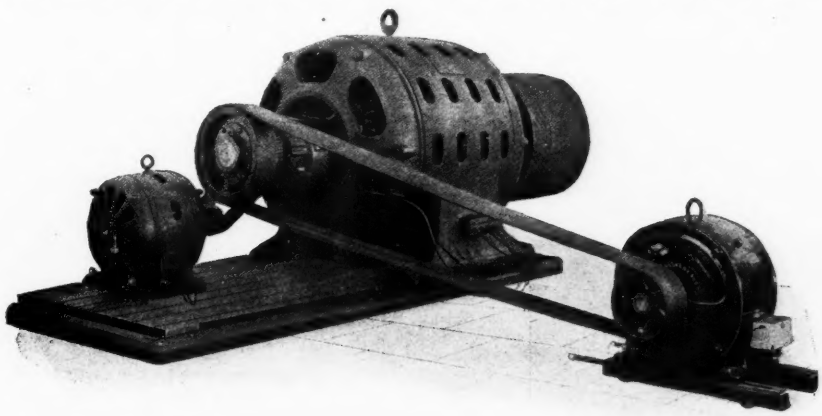
The form of this wave is determined by: (1) Number of coils per phase per pole; (2) shape of the pole-pieces; (3) eddy currents in pole-pieces; (4) air-gap.

To obtain the proper rate of cutting of the lines of force it is necessary to have, as a minimum, two coils per phase per pole in three-phase work. If but one coil per phase per pole is employed the wave form will be distorted.

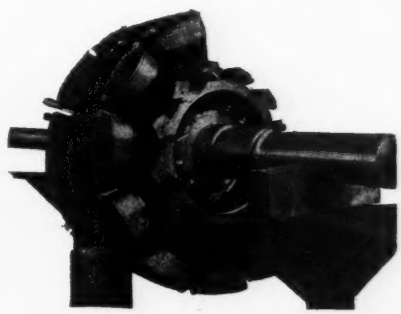
In two-phase work, however, three coils per phase per pole are desirable. Wagner three-phase generators provide in all cases at least two coils per phase per pole, and in some instances four or five. All two-phase generators provide at least three coils per phase per pole, and in some instances five or six. To prevent a concentration of the lines in the pole tips, which affords the shortest path, the pole-pieces of the Wagner generators are so shaped as to provide greater air-gap at the tips, thereby insuring proper distribution of lines of force over the entire pole area. Eddy currents in these generators are eliminated almost entirely by laminating not only the pole-pieces, but also the entire pole core. The depth of the air-gap is suitably designed with regard to its effect upon regulation and efficiency, and also (but to a less extent, as not affecting it so largely as the other two) the wave form.

The Wagner generators and synchronous motors are designed to operate upon different portions of the characteristic magnetization curve—a distinction not usually made—on account of the condition which frequently arises in plants where the starting current of any one motor is a considerable proportion of the current capacity of the generator, requiring during the starting of such motor, excess excitation of the generator. It must be remembered that the current usually required at starting for polyphase motors is considerably in excess of normal, and of low power-factor. A departure from this policy can be made, however, where it may be considered expedient.

The characteristics of the wave form can be largely predetermined, but cannot readily be changed after installation. In ordering additional equipment which is to operate in multiple with existing generators, purchasers should furnish oscillograph curves showing the wave-form characteristics of the existing apparatus.



WAGNER 200-HORSEPOWER SYNCHRONOUS MOTOR WITH EXCITER AND INDUCTION STARTING MOTOR SET UP FOR TEST.



REVOLVING FIELD FOR WAGNER GENERATOR UNDER CONSTRUCTION.

Electric Motor Boats.

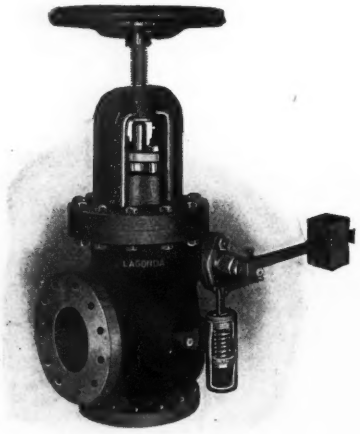
A recent number of *The Electrical Times* (London) gives an account of some excellent electric motor boats at present successfully in use on the Thames near London, where they are the most popular kind of self-propelled vessels. A brief account of one of these will be of interest.

The *Merry Widow* is a canoe with torpedo stern, carvel built in half-inch Honduras mahogany, with American elm timbers, and stem and stern posts of British oak. She is twenty-two feet long, three feet ten inches wide, and draws twenty inches of water. There are punt cushions to accommodate four persons, either sitting or reclining, while the steering can be done on the right-hand side of the aft seat, and the electric motor is adjusted by the controller on the left. There are two speeds both ahead and astern. The motor was made by Blenheim and Company, of Egham, and will develop two-and-three-quarters brake-horsepower. There are twenty Leitner cells, made by the Accumulator Industries, Limited, each with its eleven plates, measuring seven by seven-and-one-half inches. This equipment supplies thirty-five amperes for five hours and affords a maximum speed of seven to eight miles an hour.

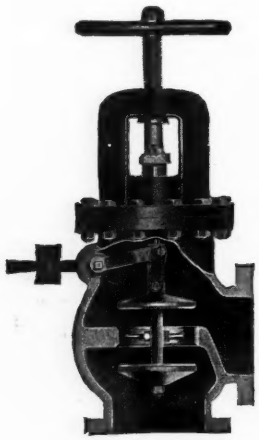
Lagonda Automatic Cut-Off Valve.

While the introduction of the water-tube boiler has greatly reduced the liability of disastrous explosions, yet the fact remains that there are still numerous casualties due to failures in this type of boiler. If a single tube ruptures, or a nest of tubes pulls out of the header, or a steam main bursts, the danger of wrecking the plant is slight, but the escaping steam is liable to scald attendants and it is usually impossible to get at the injured part. The whole plant is liable to be tied up until pressure on the whole battery has been reduced by the steam emptying through the break.

Harmful results from failures in water-tube boilers can be successfully prevented by installing an automatic cut-off valve. When one of these valves is installed between each boiler and the steam header, it forms an automatic stop, no matter where the break may occur.



LAGONDA CUT-OFF VALVE.



SECTION OF LAGONDA CUT-OFF VALVE.

The valve illustrated herewith, manufactured by the Lagonda Manufacturing Company, Springfield, Ohio, is of the double-acting type, that is, it works equally well in either direction. Should a single tube in one boiler give way this valve will instantly isolate that boiler. On the other hand, if a break occurs in the steam main between the boiler and the engine, or for that matter in any part of the steam loop, all of the valves instantly close, preventing escape of steam.

This valve depends for its action upon the actual flow of steam and not upon differences in pressures, and whenever abnormal flow occurs in either direction the valve instantly shuts. This valve takes the place of the ordinary stop valve and can be used as such, but should not be confused with the ordinary single-action, non-return valve.

One important feature of the Lagonda valve is that there are no internal working parts. The dash pot on the outside is to prevent chattering or the closing of a valve too quickly or when sudden overloads occur.

A number of tests were made in Washington, D. C., last January before a board of supervising engineers of the Department of Commerce and Labor. These tests showed that when an opening was made between the valve and the boiler, equivalent to an outlet one-and-five-sixteenths inches in diameter, that the valve closed promptly. To show the action when a break occurs on the other side of the valve a quick-release valve was opened corresponding to an outlet of one-and-one-half inches in diameter. The valve closed in two seconds and the steam pressure was only reduced from 180 to 140 pounds, the rush of steam closing the valve.

Other interesting tests were made which prove conclusively the reliability of this valve. To test its action under sudden overload a quick-release valve was opened corresponding to an opening of one-and-one-half inches. Thirty seconds was consumed in opening the quick-release valve this time, and the steam pressure dropped from 180 to ninety pounds, but the automatic valve remained open. These tests prove that the valve can take care of any unusual but legitimate demand for steam, and still be sensitive enough to close quickly in case of accidents. By means of the dashpot and weight the valve can be adjusted to suit the local conditions of steam pressure and overload.

The board of supervising engineers who witnessed these tests expressed their unqualified approval of the automatic valve and approved its use in all marine service. The valve is built in sizes from three to twelve inches. A special "low-down" type is for use where head room is limited.

Successful Buckeye Conference.

The annual conference of the Buckeye Electric Company was held during the week of August 15 at Camp Buckeye, located on the lake shore some eighteen miles east of Cleveland. Every branch manager and salesman in the employ of the company attended, twenty-four in all.

Camp Buckeye, in both location and equipment, proved an ideal spot for the conference. The camp consisted of a dozen sleeping tents, a commissary tent presided over by Howie, the leading Cleveland caterer, and the "big top" under which were held the business meetings. Heretofore the Buckeye conferences have been held in hotels, and the novelty of a week of tent life proved a popular change to the men.

Business and pleasure were mixed in about equal parts. Prior to departure for the camp, the party inspected the Buckeye factory at Cleveland and were also made familiar with the work of the engineering department of the National Electric Lamp Association. In camp, four days were given over to business sessions and one day to the entertainment of some twenty guests from the city.

Royalty Buys a Baker Electric.

It is reported that the King of Siam has purchased an electric victoria from the Baker Motor Vehicle Company, Cleveland, Ohio. While the chassis and body of this car are standard equipment, the finish and appointments are luxuriant and magnificent. The body and running gear are finished in ivory. The top is made of special leather, enameled in white. The dash and fenders are in white patent leather. The side panels and front of the hood are emblazoned with the king's crest, and the car is upholstered in a delicate pale green broadcloth, the royal color of Siam, with silver gray Persian broad lace tapestry, puff rolls and silver gray silk cord and seaming lace. All metal parts are silver-plated, and the electric lamps and metal case are of solid silver. The lever handles are of pearl. Beveled glass curtain lights are provided at each side of the hood, and also in the rear. The whole effect is in keeping with Oriental extravagance modified by the most modern and up-to-date invention and refinement.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, AUGUST 22.—The National Electrical Contractors' Association has recently taken a new lease of life and is making a determined effort to prevent the legislative establishment of a virtual monopoly of electric wiring powers on the part of municipalities. Although the Association clause in the new electric-lighting Act, to the effect that all such work can only be carried out by municipalities through a contractor, has been cut out by the House of Commons, yet the House of Lords has to approve the Commons amendments, and it is confidently asserted by the Association that the restriction as to wiring and fitting will be reinstated in the House of Lords or the whole clause deleted, leaving the position as it was. If this happens, then any municipality wishing to undertake wiring work must make a special application to Parliament, when the Contractors' Association will have the right to be heard. In the meantime, the Association is taking steps to put a stop to certain municipalities carrying out wiring work illegally, *i. e.*, without Parliamentary sanction. A test action in the law courts is to be taken against one corporation, and good legal opinion is forthcoming that the Association is bound to win the day. On top of all this, active propaganda work is being carried on throughout the country with the object of enrolling new members, one local secretary having spent his holiday in visiting a number of towns in the North of England with this object in view. In the past, the Association has regarded its functions in a somewhat lackadaisical spirit, but a new order of things has now come into existence.

A special meeting of the Institution of Electrical Engineers was held last week for the purpose of voting an expenditure of £20,000 for adapting the building recently acquired for the needs of the Institution's permanent home. The property, which has been purchased from the British Medical Association, has cost £50,000, and the extra expenditure is required for alterations, equipment and furnishing the library, which, it is claimed, will be the largest in the world. Whether in spite of or in consequence of the extended use of electricity in mines, there have lately been quite a number of accidents, mainly due to faulty electrical apparatus, and as a result of these, H. M. electrical inspector of mines has suggested one or two general considerations to be placed before manufacturers of electrical apparatus and owners of mines. In the first place, the use of cables with earthed metallic outer sheathing is recommended wherever possible; attention is called to the mechanical details of gas-tight apparatus in order to ensure that it shall be actually gas and dust tight; cables should be properly protected during shot firing; the use of oil-break switches with overload trip coils should be used wherever possible, either in substitution for or in series with ordinary fuses; live metal terminals should be avoided; or where impossible, there should be frequent inspection and cleaning. These recommendations indicate in what directions our electrical mining equipments need attention, and the value of having an electrical inspector of mines attached to the home office is emphasized by the design of at least one piece of apparatus which will remedy a defect observed in several mines. The same may be said of the electrical inspector of factories, who is also attached to the home office.

So much attention is just now being bestowed upon the possibilities of the Diesel oil engine for small installations, that it is possible that this will have an adverse effect upon the development of some of our electric power companies, especially as during recent years there has been a disposition on the part of many small local authorities to throw their electrical destinies in the hands of the power companies. An instance of this is to be seen at Rhyl, in North Wales, where extensions have become necessary. As this town is a small one and is in the area of an electric power company, this particular business is the kind that the power company might have expected. Instead, however, of taking a supply in bulk, the council have decided to dispose of one of its small steam-generating sets and to install a Diesel oil engine set. Once the advantages of this course of procedure are placed before local authorities in other districts, it is conceivable that another era of small municipal generating stations will commence—unless the power companies take steps to prevent it.

It is announced that active steps are being taken with a view to the establishment of wireless telegraph stations along the South African coast. Negotiations are being carried on with the imperial government, and one of the first sites selected is the bluff at Durban. The first scheme will include wireless stations between Delagoa Bay and Cape Colony, while another similar scheme is projected for the west coast of Africa.

The constructional iron work for the Dawson City electric power station, the contract for which was secured by Messrs. J. Booth & Son, of Bolton, in competition with American and German firms, has been sent forward, and it is anticipated will reach its destination before the Yukon River is frozen over. It is stated that the Canadian preferential tariff in favor of British goods enabled the contract to be placed in Great Britain.

A 150-ton electric crane has been completed by Sir William Arrol & Co., Ltd., of Glasgow, for the North Eastern Marine Engineering Company of Wallsend-on-Tyne, which has several extraordinary features. The square tower on which a horizontal jib of 245 feet in length is supported, is 125 feet high, and 40 feet square at the base, tapering to 35 feet at the top. The long arm of the swiveling jib has an extreme radius of 150 feet. All the operations of the cranes are carried out by fifty-horsepower Westinghouse electric motors, and all the racking and lifting machinery is placed in a steel-plated house at the tail end of the jib, the interior of which looks more like a large works than a structure used for counterbalancing a jib 125 feet above ground level. A special 2½-ton crane is fitted inside the jib house for lifting spare parts, etc., through a trap door in the floor. On test the main crane lifted 185 tons.

The urban district consul of Ventnor (Isle of Wight) contemplates the installation of a funicular railway down the face of the cliffs on which the town is built, and the operation of the cables attached to the cars will be by means of forty-horsepower electric motors, there being one for the upper and one for the lower line. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, AUGUST 21.—A company has been lately formed for operating an extensive wireless telegraph system which has Gibraltar and the Canaries as a base. It is intended to cover the Mediterranean coast region and will also be used for working with the vessels of the South American lines, so that these latter can keep up connection with the continent for a distance of 2,000 miles. The concession for the Spanish company has been accorded by the Minister of the Interior, and there is also a Paris company interested in the affair, this being the French Wireless Company, of which M. Victor Popp is the president. The latter company has been engaged for some years in erecting wireless posts in various places in Europe. All the vessels passing from the Atlantic to the Mediterranean will come into the field of the new system, so that the enterprise is one of considerable scope and it will also compete with the cable companies as regards the coast service in this region. The rates, for instance, from the Canaries to the continent will be but two-thirds of the existing cable rates in most cases.

A section of the Budapest-Fiume railroad in Austro-Hungary is to be equipped on the electric system, this being the Fiume-Kameralmoravica section. This railroad is controlled by the government, and the new section will be used as a base for further extensions of the electric system should this prove satisfactory. To supply the current which is needed for the new electric line, measures are now being taken to build a station of considerable size. The station will also furnish the current for the lighting of the depots at Fiume and Trieste. A large company has been formed for erecting the plant and Paris capital is interested in the enterprise.

Some of the regiments of the French army which will take part in the military maneuvers have been equipped with a new type of field telephone which has been designed specially for this service by the central establishment. It is of simple construction and also of light weight, besides being very convenient to use in the field. The apparatus is contained in three cases, one for the battery, a second for the telephone apparatus proper, with an extra microphone, and a third contains a reel of half a mile or more of wire which is laid along the ground.

Experiments were made near Berlin with wireless apparatus carried on board the airship "Gross" during some of the recent flights, and messages could be exchanged with Frankfort in this way. It is also expected to connect with Stuttgart. A. DE C.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

ILLINOIS TRACTION COMPANY MAKES STOCK INCREASE OF $3,000,000—The Illinois Traction Company has notified the secretary of the state of Maine of an increase in its

capital stock from $13,000,000 to $16,000,000 by adding to the number of shares already authorized 20,000 shares of common stock and 10,000 shares of preferred stock. The company was incorporated in Maine.

KANAWHA & OHIO VALLEY TRACTION—The Kanawha & Ohio Valley Traction Company has been incorporated in West Virginia, with a preliminary capital of $100,000, for the purpose of building a traction system from Kanawha Falls to Point Pleasant, W. Va., on the Ohio River, a distance of 150 miles. Former Governor F. P. Grosscup is one of the incorporators and it is proposed to build a system that will cost $5,000,000.

MICHIGAN TELEPHONE MERGER—Organization of the Home Telephone Company, of Michigan, which succeeds in the business and properties of the Home Telephone Company, of Detroit, and the Inter-State Long-Distance Telephone Company, so-called independent concerns, has been effected. Fred T. Moran, of Detroit, has been elected chairman of the board, and W. A. Jackson, president. The new company is capitalized at $5,000,000 and contemplates the issue of $10,000,000 first-mortgage bonds.

LARGE DAM FOR ALABAMA—The United States Steel Corporation has been buying up large tracts of land between Wylam and Dolomite, Ala., options for some time having been taken on practically every acre of ground that could be secured. Fancy prices have been paid for these lands. It is stated that plans are made for the construction of a dam forty feet high across the valley that will dam Camp Creek, where it is said such a volume of water can be stored that it will run every plant of the company in the Ensley district. The structure will be the longest in Alabama, and the storage of water will solve a much-vexed question for the corporation.

PROPOSED EVANSVILLE (IND.) TRACTION MERGER—Advices from Evansville, Ind., are to the effect that agents are working for a merger of the Evansville Gas and Electric Light Company and the Evansville & Southern Indiana Traction Company, and the consolidation may take in all the other interurban traction lines of the city. The gas company is now in the Union syndicate, lately formed, with sister gas and traction corporations at Rockford and Peoria, Ill. The Clarke syndicate and Hodenpyle, Walbridge & Company, of New York, are the financiers of the concern. The Evansville merger would involve $7,000,000 if it covered the gas and all traction corporations.

NEW STREET-RAILWAY PROJECT—A new street-railway project which involves the expenditure of millions in money and the connecting of Manchester, Derry and other New Hampshire points with Massachusetts beach lines, is announced, with the news of the incorporation of the Governor's Island Company for the development of the island of that name at Island Pond, Hampstead, N. H., and the paying in of capital for the Hampstead & Haverhill Electric Railway. The list of incorporators of the railway company is made up of the following: President, Arthur M. Emerson, Hampstead; secretary and treasurer, Albert A. McReel, Exeter; directors, Arthur M. Emerson, Albert A. McReel, Roswell Annis, Manchester; Henry T. Wheeler, Derry, and George A. Sawyer, Atkinson.

WASHINGTON ROAD CHARTERED—The Spokane, Walla Walla & Western Railway Company has been incorporated under the laws of Washington with a capital of $3,000,000, to build a line through Columbia, Walla Walla and southern Washington counties to Umatilla County, Ore. E. M. Symonds, of Spokane, is president, M. S. Parker, of Spokane, is vice-president and chief engineer, and L. H. Hoffman, connected with a railway supply house, is secretary and treasurer. Announcement is made that the company has acquired the franchises, rights-of-way and surveys of the Columbia River & Walla Walla Traction Company, including franchises in the cities of Walla Walla, Waitsburg and Dayton, Wash., and Wallula, Ore. It is stated that the company expects to begin operations in a short time, and probably will have the line in operation from Wallula to Walla Walla early in May, 1910. From that point the work of construction would be pushed rapidly until the Snake River was reached and connections made for Spokane.

POWER AND IRRIGATION PLANS IN WYOMING—Asmus Boysen, of Chicago, formerly a member of Congress from Iowa, who, operating as the Big Horn Power Company, invested $400,000 in constructing a dam of concrete, reinforced with steel, thirty-five feet high and 200 feet long, across a canyon of the Wind River, twelve miles from Shoshoni, Wyo., in the Copper Mountains, has also completed his surveys and made filings in the office of the state engineer for a similar plant in the big Popo Agie Canyon, about six miles above Lander, and intends to begin the work of construction as soon as the wires are strung and the other plant has begun the sale and delivery of power. While Boysen has been the pioneer in the utilization of the many thousands of horsepower now going to waste in the Lander Valley, a number of other companies have made filings, and it will only be a short time until this valuable asset will bring in various manufacturing enterprises to take advantage of the cheap power. The Enterprise Irrigation and Power Company, an association of ranchmen owning about 5,000 acres of farm lands southwest of Lander, has constructed a ditch to convey the water to their lands, and when all their acres are put under cultivation their charter will enable them to utilize the same water to generate power for a beet sugar mill and other factories that may be needed. They will furnish light, power and, possibly, as new appliances are invented, heat, also, to supply their homes and barns in winter. It will undoubtedly enable them within a few years to organize one of the richest model farming communities in the world, and there are hundreds of similar opportunities to utilize nature's resources all over this section of Wyoming.

RAILWAY TO CROSS MISSOURI—A double-track, high-speed electric line across Missouri, following the shortest route across the state, is the project of the St. Louis & Kansas City Electric Railway Company. The corporation will have a capital of $15,000,000. W. D. Nevin, of Denver, is mentioned for the presidency W. H. Chase, formerly police commissioner; Benjamin F. Gray and Edgar R. Tilton, of St. Louis, are actively interested in the undertaking. Daniel F. Miller, a former official of the Brooklyn street-railway system, and several Kansas City bankers are associated with the organizers. According to statements of the organizers of the company a double-track right-of-way has been obtained from the Mississippi River to the Missouri. The plan is to lay a double-track road straight through the heart of Missouri from St. Louis to Kansas City. The length of the line will be 250 miles, which is twenty-six miles shorter than the shortest steam-railroad route. Trains will be operated over the whole distance in five hours. The multiphase system will be employed. According to plans under consideration, it will be virtually a gradeless road. The grade will be less than one-tenth of one per cent over eighty per cent of the distance, and less than one per cent over the remaining twenty per cent of the road. It has been estimated that the road can be constructed at approximately $50,000 a mile.

TORREON, MEXICO—The Nazas Power Company has completed all arrangements for the carrying into effect of the large projects proposed in Mexico and work will begin within sixty days. The company will first erect a power plant on the Nazas River, in the Fernandez canyon, about sixty miles southwest of Torreon. The plant will have an initial generating capacity of 20,000 horsepower, and this will be increased from time to time as the occasion demands. The cost of the plant and the transmission lines will be about $10,000,000, gold. Power will be furnished to the American Smelting and Refining Company at Valardena to Torreon for lighting and street-railway purposes. Gomez Palacio, Lerdo and many other manufacturing towns and mining camps in the surrounding country. The company expects to materially lessen the present cost of electrical power in these places. Under the terms of the concession the plant must be ready for operating by January, 1911. The dam which will furnish the power will be thirty-eight metres high and 235 metres in length. The surplus water will be used for irrigating purposes and part of the power for operating irrigating pumps. Walter F. Lineberger, of Torreon, Mexico, is the engineer in charge of the work. J. A. Spafford, of New York, is president of the Nazas Power Company and L. H. Hacker, vice-president and general manager. D.

LIGHTING AND POWER.

(Special Correspondence.)

RYAN, OKLA.—This city has voted $6,000 of electric-light bonds.

BOULDER, COLO.—A new power, light and heating plant is to be installed on the University campus here at a cost of $70,000.

WONDER, NEV.—The Nevada Wonder Company is planning the immediate construction of an electric power plant at Fallon, forty miles from Fairview.

ASHLAND, ORE.—R. I. Stewart has been awarded a contract for the erection of the municipality's hydroelectric power house, on his bid of $3,343.

DE PERE, WIS.—The De Pere Electric Company will expend about $10,000 for new machinery in order to change the alternating current to a direct one. C.

MOHAVE COUNTY, ARIZ.—At the Treasure mine, southwest of the Thomas Reed, preparations are being made to install a milling plant and electrical equipment.

SHEBOYGAN, WIS.—Estimates and plans have been prepared for the construction of a power plant at Ashby Rapids, on the Sheboygan River, four miles from here. C.

JACKSON, MISS.—The Mississippi Electric Company, of Vicksburg, has been incorporated. Capital, $10,000. Incorporators: John Hincliff, W. G. Paxton and others.

MINNEAPOLIS, MINN.—Dr. P. M. Hall, health commissioner, will ask the board of tax levy for $50,000 to $75,000 with which to install an electric-lighting plant at the crematory, to light the entire north and northeast portions of the city. The estimated cost of the installation is as follows: Engine and

dynamo, $16,000; wiring and poles, 50 miles, $60,000; lamps, 600, at $25 each, $15,000. C.

WILMINGTON, DEL.—The Hartel Light Company has been incorporated, capital $2,500,000. Incorporators: C. F. Fox, M. L. Rogers, H. W. Davis, all of Wilmington.

GRAND RAPIDS, MINN.—It is proposed to change over the street-lighting system from the arc lamp to tungsten incandescents, similar to the system in use at Coleraine, Minn. C.

DULUTH, MINN.—An agitation has been started by property owners along East Superior Street, between First Avenue, East, and Fifth Avenue, East, for the installation of side cluster lights. C.

SOMERSET, WIS.—The Apple River Power Company has purchased the Ames-Mason mill property and will put in a dam with a forty-one-foot head and install a fifth electric power transmission plant. C.

CENTRAL CITY, COLO.—The management of the Maumee Gold Mining Company, owning a group of claims near the War Dance, contemplates the installation of a large plant, using electricity as motive power.

CLEAR CREEK COUNTY, COLO.—Surveyors have been at work for some time in going over the ground near the Doric adit, where the new mill of the Griffith Mining Company is to be erected. W. D. Hoover of Denver is manager.

SALT LAKE COUNTY, UTAH—The Silver Shield Mining and Milling Company is planning to issue five and seven year bonds to raise capital to build a sixty-ton mill and concentrating plant at its mine in Bingham Canyon. Harry S. Joseph is manager.

ABERDEEN, S. C.—The Aberdeen Light and Power Company will more than double the capacity of its plant at an expenditure of $30,000. Among the improvements planned are new buildings, and the installation of a 200-kilowatt generator, a new engine and a fourth gas producer. C.

AUSTIN, NEV.—The Austin-Manhattan Company is figuring on installing the entire equipment for a producer gas plant for mining and milling purposes. The plant is to have a capacity of 400 horsepower and will use as fuel either coal or California crude oil. The company will announce its decision on bids soon after August 20.

ST. JOHN, N. B.—Sir William Van Horne, when on the witness stand last week in an investigation into the affairs of the Grand Falls Power Company, declared that he placed the value of the power site there, still undeveloped, at a million dollars, and stated that it was not equaled on the Continent. "We have nothing to compare with it in all America," said Sir William. "It is immense and is in such close proximity with the finest timber lands of the province."

RUSSELLVILLE, ALA.—The engineers have begun making estimates and surveying the grounds for the erection of the electric-light plant in Russellville for which a franchise was given to Armes & Thornton, of Birmingham, a short time ago. Under the terms of the franchise the erection of the electric plant must be commenced by next February and completed in six months, and the water works plant to be commenced in 12 months and completed in 18 months.

COLUMBIA, N. J.—The contract for the construction of a hydroelectric development across Paulin's Kill, Columbia, N. J., for the Warren County Power Company, Meikleham & Dinsmore, engineers, has been awarded to Frank B. Gilbreth, 60 Broadway, New York city. This contract includes the construction of a Ransom hollow dam thirty feet high and 350 feet long, as designed by Ransom & Hoadley, of Providence, R. I., a reinforced concrete power house and a tailrace, etc.

SANTA BARBARA, CAL.—Negotiations are about completed for the merger of the Merchants' Mutual Light and Power Company of this city with the local gas and electric plant of the Edison Electric Company. An entirely new corporation, known as the Santa Barbara Gas and Electric Company, with a capital of $1,000,000, will result, which will be operated independently of other Edison interests in Southern California, though owned largely by the Edison stockholders.

DULUTH, MINN.—W. R. Merriam, former governor of Minnesota, has been elected president of the Superior Water, Light and Power Company by a meeting of the directors held at Superior. W. H. Winslow, who has been acting manager for some time past, was named as general manager. Among the directors who attended the meeting was Robert R. Dunn, of St. Paul. It is understood that many new improvements are planned for the company during the ensuing year.

STERLING, KAN.—The City Council of Sterling has granted a franchise to and entered into a contract with the Morris Electric Company to furnish lights to the town for a period of five years. The company agrees to furnish thirty sixty-candle lamps, fifty-eight thirty-two-candle power lamps and sufficient lights of various sizes to light the city hall, water works and other public property, for which service the company is to receive $135 a month for an all-night service on a moonlight schedule.

SACRAMENTO, CAL.—It is reported that John A. Britton, general manager of the Pacific Gas and Electric Company, has commenced the installation of a big electric power plant near Horseshoe bar, on the middle fork of the American River, some three miles from the town of Forest Hill, Placer County. The plant will furnish power for the operation of the Cash Rock mine, where the big dredger was washed out last winter at a loss of $150,000. It will be transmitted to other industries in the foothills and Sacramento Valley.

ROCKLAND, MASS.—The board of gas and electric light commissioners has given its approval to a consolidation of the Cohassett Electric Company with the Electric Light and Power Company, of Abington and Rockland. Under the terms of the consolidation the latter company is to pay $18,000 for the property of the former and to assume all of its debts. The board finds that facilities for furnishing light, heat and power will not be diminished by the consolidation, and decides that the consolidation under the terms agreed upon is consistent with the public interest.

DANVILLE, VA.—Danville will have the largest individual cotton-mill corporation in the South, following the consolidation of the Riverside Cotton Mills and the Dan River Power and Manufacturing Company, which has been effected at meetings of the stockholders of the two corporations. The new corporation will have a capital stock of $7,000,000. Stock in the Riverside mills, of the par value of $100, is to be exchanged for $175 worth of stock in the consolidated corporation. The old officials will be retained. The mills own 1,200 acres near the city and have three dams across the river.

ROCHESTER, MINN.—C. H. Armstrong, county surveyor of Olmsted County, and city engineer of Rochester, has organized the Zumbro Power Company, with offices in this city, and incorporated in Minnesota. It is capitalied at $300,000. It is intended to construct a power plant at Zumbro Falls, fourteen miles north of here. The dam will be 91 feet at its base, 50 feet high and 450 feet across the top. The current is to be supplied to the towns, cities and villages throughout southern Minnesota for lighting and power purposes. It is the greatest undertaking planned in southern Minnesota for years.

GREAT FALLS, MONT.—Work has been started here on the big transmission line which will convey electricity from the dams now being built here to Butte and Anaconda for the operation of mines and smelters. The first of the dams will probably not be ready until June next, but it is desired to have everything in readiness to deliver electricity as soon as it can be generated. The line will be of the most substantial material, heavy copper wire on high steel towers. It will run in a bee line, the distance to Butte being 129 miles. The power to be generated from the Rainbow falls will be about 38,000 horsepower, but in all there will be generated here over 100,000 horsepower.

MONTREAL, CAN.—The first sod of the Canadian Light, Heat and Power Company's new plant at St. Timothee was turned July 29 by the Hon. Rodolphe Lemieux, the Canadian postmaster-general. George Crane, engineer in charge of the works, explained the system. He said it was the intention of the company to develop at the present time 21,600 horsepower. "From the point where the water enters the canal," said Mr. Crane, "to our power house, there is a head of fifty-two feet, and all the water from the St. Lawrence to draw from. The water is taken from the canal into a forebay which is to be constructed at St. Timothee, and from which the water will be taken to run the plant. It is the intention of the company to spend about $2,400,000 in the development of 21,600 horsepower, and it is claimed that by deepening and widening the canal as high as 72,000 horsepower can be obtained."

SALISBURY, N. C.—A judgment for $325,000 has been rendered by United States Judge J. C. Pritchard, at his home in Asheville, in favor of the T. A. Gillespie Company, of New York, contractors, against the Whitney Company, of Salisbury, which has been developing a large waterpower until the concern went into the hands of a receiver. This lien, held by the construction company, has been declared by the court, prior to one held by the Bankers' Trust Company. This decision is held to be unfavorable to the Bankers' Trust Company in that the holders of the bonds in question will have to wait until the judgment has been paid before they can participate in the proceeds of the sale of this large property. The Gillespie Company built a large dam across the Yadkin River, below Salisbury, opening the way for another waterpower development of unusual size, and the distribution of electricity in large quantities. It is understood now that the formal sale of the property will be made at an early date, and the purchasers will no doubt continue the big task already instituted and on which several millions have already been expended. The judgment is against the Whitney Company and the receivers of the same, Messrs. John S. Henderson and C. W. Smith. L.

ELECTRIC RAILWAYS.

(Special Correspondence.)

SANTA BARBARA, CAL.—The Santa Barbara Consolidated Railway Company has asked for an additional franchise in this city.

CEDAR RAPIDS, IOWA—Contracts aggregating $125,000 have been let for improvements at the plant of the Iowa City & Cedar Rapids Interurban. C.

PAULINA, IOWA—The citizens of this community will make an effort to have the Spirit Lake-Sioux City interurban include the city in its route. C.

DENVER, IOWA—The Waterloo, Cedar Falls & Northern Railway Company announces that it will extend its track to Waverly, a distance of six miles. C.

OLIVET, S. D.—L. F. Phillips, who is installing an electric-light plant at Scotland, S. D., is back of a movement to construct an electric railway to that town. C.

HOBART, IND.—Construction work will be resumed on the Gary, Hobart & Valparaiso electric line September 6. Cars are expected to be running this fall. S.

SAN DIEGO, CAL.—The San Diego Electric Railway Company is preparing plans for the erection of reinforced concrete car barns, at a cost of $100,000.

FOXBORO, WIS.—It is stated that the construction of the proposed electric Twin Cities & Lake Superior electric line is being pushed rapidly in the vicinity. C.

OGDEN, IOWA—It is reported that the Fort Dodge, Des Moines & Southern Interurban Company will commence the immediate construction of a line to Fraser Junction. C.

DANVILLE, IND.—Work has been resumed between this city and Amo on the Danville-Amo traction line, which will be controlled and operated by the Terre Haute, Indianapolis & Eastern Traction Company. S.

DAVENPORT, IOWA—J. W. Walsh let the contract to the Westinghouse Electric Company, of Pittsburg, for all the electrical equipment for the power house of the new Rock Island Southern interurban. C.

TACOMA, WASH.—The Puget Sound Electric Company, which owns an interurban electric line between Tacoma and Seattle, has purchased the lines, equipment, franchises and rights-of-way of the Pacific Traction Company.

SALEM, ORE.—Articles of incorporation have been filed in the office of the secretary of state for the Baker Interurban Railway Company; principal place of business, Baker City; capital stock, $50,000; incorporators, Thomas B. Neuhausen, A. K. Bentley and Anthony Mohr.

KINGMAN, IND.—Work is progressing on the Covington & South Western Traction Company's line between Kingman and Covington. The road will also be built to Crawfordsville. The power house at Kingman is about completed and the machinery and equipment are now being installed. S.

PALO ALTO, CAL.—The authorities of Stanford University have completed plans for the construction of an electric railway on the university campus. The line will be built and owned by the university, but arrangements have been made for the Peninsular Railway Company to run its cars on the line.

SAN FRANCISCO, CAL.—It is announced that the Peninsular Railway Company, a Harriman property, controlling a number of electric lines and franchises just south of San Francisco, will at once build the proposed line between Palo Alto and Mayfield. The new construction will amount to twelve miles.

SAN FRANCISCO, CAL.—With a capital stock of $12,000,000, the Peninsula Railway Company, which is a merger of the Peninsula Railroad Company, the San Jose-Los Gatos Interurban Railway Company and the Santa Clara Interurban Railway Company, has filed incorporation papers. The three companies own a total of 222 miles of electric railways in Santa Cruz, Santa Clara, Alameda and San Mateo counties.

AUSTIN, TEX.—The charter of the San Angelo Street Railway Company, having a capital stock of $100,000, has been filed. The company is composed of citizens of San Angelo, who have taken over the property of the street-railway company, which has been in the hands of a federal receiver. The Port Arthur Traction Company, with a capital stock of $200,000, has filed articles of incorporation. The company is composed principally of Ohioans.

ALLENTOWN, PA.—Starting with $200,000, the upset price fixed by order of court, the property of the Philadelphia, Bristol & Trenton Street Railway Company was knocked down in the Court House at Doylestown at $380,000 to Carl N. Martin and John Redmond, of Philadelphia, representing the bondholders' committee, which holds $627,000 of the issue of $650,000 of bonds of the company. The sale means, it is said, a reorganization of the company and an improvement of the line from Philadelphia to Trenton.

BOONE, IOWA—General Manager Blake announces that the Des Moines & Southern Interurban Company would within a week start the construction of an interurban line from Frazer Junction to Ogden, giving the people of that town a two-hour service to Boone, Fort Dodge and Des Moines. The work is to be pushed rapidly.

EL PASO, TEX.—The Electric Street Car Company, owning electric lines in this city and at Juarez, in the Mexican state of Chihuahua, has obtained a concession to extend its lines in the latter city to Rio Grande, Sierra Madre and Pacific Depot, and from there to the new race track of the International Racing Association.

RICHMOND, CAL.—The Holman Car Company, which recently absorbed the Pacific Power and Foundry Company, of San Francisco, has secured a ten-acre site at this place and will, it is understood, expend $300,000 in the building of a car factory. It is given out that the company will reincorporate with a capital stock of $1,000,000.

EUGENE, ORE.—The Willamette Valley Company, of which A. Welch is the head, is making arrangements for the construction of a hydroelectric plant at Martin's Rapids. The company is planning to build a number of extensions in the lower valley during this year, the first to be from Eugene to Junction City, this fall, and ultimately to Portland.

DES MOINES, IOWA—Work on the Creston and Winterset interurban line is to begin at once. It is stated by local directors of the Creston road that capitalists of Creston and Macksburg are going to put the branch between their towns in operation at once in order to test the new road, and if this test is successful the remainder will be built at once.

APPLETON, WIS.—A. L. Gettys and C. L. Robins, Chicago experts sent by Chicago capitalists to inspect the proposed route for an interurban line between this city and Marinette, stated upon their return that they would recommend the immediate construction of the line from Appleton to Seymour, and that the extension to Oconto and Marinette would come in a short time.

PEORIA, ILL.—The Peoria and Galesburg Interurban will at once let contracts for the grading for the entire road, together with the other work to finish the road. Operations to commence at the Galesburg end and complete the line towards this city. Several bridges are needed to cross the rivers on the right of way. President Stevens expects to have the line built by the first of the year. V.

HARRISBURG, PA.—The Bedford, Fulton & Franklin Street Railway Company has been granted a franchise at Bedford for a new electric line. The promoters of the company are said to be Pittsburg railway men. If the road is built it will form part of a great 'cross-state electric railroad system, which will in all probability eventually connect Pittsburg on the west and Harrisburg and Philadelphia on the east.

BLUFFTON, IND.—Master Commissioner Morris has made a finding in favor of the Moore-Mansfield Construction Company for $12,140.81 against the Bluffton, Marion & Eastern Interurban Company for construction work. The company claimed there was $125,000 due it from the traction company and the latter offered to pay $17,000. The master said there was no occasion for a foreclosure of the mechanic's lien. S.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

DAYTON, OHIO—The Central Union Telephone Company has begun work on its East End branch, which will cost $200,000. The building will have a switchboard capacity of 5,000.

MILWAUKEE, WIS.—The Sturgeon Bay and Gardner Telephone Company, of Brussels, has been incorporated. Capital stock, $1,500. Incorporators: Hubert Dandors, S. A. Geise and Jule Gerondale.

AUGUSTA, ME.—The Gulf States Telephone Corporation has been incorporated here to maintain and operate telephone and telegraph lines. Capital stock, $2,500,000. M. F. Shehan, president and treasurer.

TEMPLE, TEX.—The Temple city council at a regular session held last week finally granted a twenty-year franchise to the Southwestern Telephone and Telegraph Company, thus concluding several months' strenuous negotiations.

SAN ANTONIO, TEXAS—The announcement is made by the Southwestern Telegraph and Telephone Company of the erection of a six-story exchange building at 215 Travis Street of steel and brick construction, made necessary by increased business. Three stories are to be finished before December 1 and occupied. A new switchboard, that will accommodate 9,600 subscribers, will be installed. The company, due to the demand, is planning

extensions of cables and a greatly increased service. A lunch room on the cost-price plan for girls and other features will be added. When the new building is finished it will be the first large central office constructed by the company.

MEXIA, TEXAS—The Mexia Telephone Company has sold its plant in this city to a new company, which will install an up-to-date flashlight system at once. The capital of the new company is $12,500, fully paid up, composed of local capital entirely.

SALEM, ORE.—Articles of incorporation have been filed in the office of the secretary of state for the United Telephone Company, home office at Woodburn, Marion County. Capital stock, $30,000. Incorporators: W. H. Waterbury, Blaine McCord and Will Mishler.

EAST HEBRON, ME.—The East Hebron Telephone Company has been organized at East Hebron for the purpose of constructing, maintaining and operating telephone lines, with a capital stock of $10,000. A. M. Fogg, of East Hebron, president; Everett E. Johnson, of Hebron, treasurer.

VANCOUVER, WASH.—The new telephone line between Vancouver and Manor, built by the Manor Telephone Company, is completed, and is fitted out with sixty-five telephones. The Manor Telephone Company is incorporated, the capital stock being $5,000, divided into 100 shares of $50 each.

SAN RAFAEL, CAL.—The Pacific Telephone and Telegraph Company has let contracts for the installation of underground cables to displace its overhead system on certain streets in this city. The same company is also laying underground a 200-pair cable from this place to San Anselmo.

DALLAS, TEXAS—The Knights of the Shield is the name of a new secret order formed here by the independent telephone men. Aaron Smith, who has taken a prominent part in the preliminary work of the new order, declares that the fraternity is not intended to supersede the Independent Telephone Association, but merely to be an auxiliary to that organization.

HOUSTON, TEX.—The Home Telephone Company will spend $600,000 for improvements in the next eight months. San Jacinto street, between Texas and Capitol avenues, is the site selected for the erection of a building for their central offices, this building to be of concrete, two stories and a high basement, with fifty-foot frontage. The site and building together will cost upward of $40,000.

ELY, NEV.—Telephone service will soon be extended by the White Pine County Telephone Company to the Magnuson and Comins ranches in Steptoe valley, and the line will probably be extended from there to the Nevada United Mines at Ward in the near future. The new lines to the mines will soon be completed, though the new power line, which is being strung to Copper Flat and the Star Pointer, forces Manager Bennett to survey a new route between those two places to avoid interference.

ST. JOSEPH, MO.—Two thousand telephones in Andrew County have been added to the system of the Home Telephone Company. Theodore A. Gary, president, has closed a contract with the Andrew County Mutual Telephone Company for forty-three years. The company has exchanges at Savannah, Avenue City, Cosby, Filmore, Helena, Rochester, Whitesville, Bolckow and Rosendale, and the Home Telephone Company will begin at once stringing new lines to tap the systems. The Selden-Breck Construction Company has been awarded the contract for building the new exchange of the Home Telephone Company on the west side of Tenth street, north of Jule. The building will cost about $80,000.

AMESBURY, MASS.—In order to compete with the New England Telephone Company, it is the plan of the promoters of the new independent concern to extend the venture to the cities of Lowell, Lawrence, Salem, Lynn and Boston, swinging around a circle, with Haverhill as the pivot. Charles A. Davis, of Haverhill, who is interested in the venture, states that he is not to manage the enterprise and he does not know who is going to do so. He asserts that two capitalists in Massachusetts are back of the movement. The venture, as they plan to undertake it, will cost about $300,000. It will necessitate exchanges at Haverhill, Lowell, Lawrence, Salem, Lynn and several in Boston, with trunk lines from place to place.

DETROIT, MICH.—Organization of the Home Telephone Company, of Michigan, which succeeds to the business and properties of the Home Telephone Company, of Detroit, and the Interstate Long Distance Telephone Company, so-called independent concerns, has been effected. A number of St. Louis, Mo., capitalists appear in the list of directors. Fred T. Moran, of Detroit, was elected chairman of the board, and W. A. Jackson, formerly president of the Michigan State Telephone Company, was elected president. The St. Louis directors are Albert N. Edwards, E. A. Faust, A. W. Lambert, M. F. Bayard, Bliss Michael, Henry Koehler, Jr., E. F. Goltra and Samuel D. Jeffries. The new company is capitalized at $5,000,000 and contemplates the issue of $10,000,000 first-mortgage bonds. It is planned to expend $1,000,000 on immediate extensions.

ELECTRICAL SECURITIES.

The market has settled down to more normal conditions in the past week, and while trading has become narrower prices do not fluctuate in the way that has characterized the transactions of the past two or three previous weeks. There have been continued signs of strength as far as industrials are concerned, General Electric and American Telephone and Telegraph Company having both recorded advances. For the present most prevailing influences have been discounted, and until the public comes in there is not much likelihood of any great movement either up or down for a while to come.

The Michigan State Telephone Company, the securities of which are owned largely in Chicago, reports for the first seven months of this year a gross revenue of $2,162,115, which is an increase of $223,420 over the gross in the corresponding period last year. The surplus earnings, after the payment of all operating and interest charges and dividends on the stock, were $175,168. The company expended out of its surplus earnings $816,306 between February, 1904, and the first of the present month. The net gain in new stations in the first seven months this year was 10,385.

There has been added to the regular list of the Philadelphia Stock Exchange $119,200 additional capital stock of the American Telephone and Telegraph Company, issued in exchange for $160,000 four per cent convertible bonds of the company, making the total amount of said bonds outstanding $69,005,000.

DIVIDENDS.

Brooklyn Rapid Transit Company; regular quarterly dividend of one per cent, payable October 1 to stock of record September 9. Rochester Railway and Light Company; regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable September 1 to stock of record August 24. There has been listed on the Philadelphia Exchange $650,000 additional Philadelphia Rapid Transit collateral trust five-per-cent gold bonds maturing in 1957.

NEW YORK.

	Aug. 30.	Aug. 23.
Allis-Chalmers common	15	15¾
Allis-Chalmers preferred	50½	53¾
Amalgamated Copper	83	85⅜
American Tel. & Cable	80*	80*
American Tel. & Tel.	139	140
Brooklyn Rapid Transit	78⅝	81
General Electric	165¾	168
Interborough-Metropolitan common	14	15
Interborough-Metropolitan preferred	46½	47½
Kings County Electric	131	130
Mackay Companies (Postal Telegraph and Cables) common	81	82
Mackay Companies (Postal Telegraph and Cables) preferred	74½	74½
Manhattan Elevated	141½	141
Metropolitan Street Railway	20	20
New York & New Jersey Telephone	137½	142
U. S. Steel common	75¼	76¾
U. S. Steel preferred	124	125
Western Union	73	73½
Westinghouse common	84¾	86¼
Westinghouse preferred	120	120

*Last price quoted.

BOSTON.

	Aug. 30.	Aug. 23.
American Tel. & Tel.	139	140
Edison Elec. Illuminating	253	252
General Electric	165¾	168
Massachusetts Electric common	15	14
Massachusetts Electric preferred	74	73½
New England Telephone	..	137
Western Tel. & Tel. common	11	11
Western Tel. & Tel. preferred	89	89½

PHILADELPHIA.

	Aug. 30.	Aug. 23.
American Railways	46¾	46
Electric Company of America	12⅛	12⅜
Electric Storage Battery common	68½	60½
Electric Storage Battery preferred	68½	60½
Philadelphia Electric	12	11⅛
Philadelphia Rapid Transit	30	30¼
Philadelphia Traction	90½	90
Union Traction	53¼	54

CHICAGO.

	Aug. 30.	Aug. 23.
Chicago Railways, Series 1	108	108
Chicago Railways, Series 2	37¼	37¼
Chicago Subway	19½	19½
Chicago Telephone	135	135½
Commonwealth Edison	120½	120⅞
Metropolitan Elevated common	15⅛	15⅛
Metropolitan Elevated preferred	49	49
National Carbon common	95	95
National Carbon preferred	119	119

PERSONAL MENTION.

H. M. HIRSCHBERG, president of the Excello Arc Lamp Company, of New York, spent several days in Chicago last week, accompanied by Mrs. Hirschberg.

A. W. LEWIN was advanced on September 1 to the position of manager of the New Orleans office of the Sprague Electric Company. Mr. Lewin has been connected with the office for some time. He is a member of the American Institute of Electrical Engineers and has had extensive commercial and engineering experience in the electrical business both in North and South

America. This experience, combined with his command of the various languages spoken in his territory, portends a successful career in his new position.

A. C. GARRISON, president and treasurer of the Columbia Incandescent Lamp Company, St. Louis, Mo., has just returned from an extended vacation in Michigan and on the St. Lawrence River.

WILLIAM RUSSELL WILLCOX, chairman of the New York Public Service Commission for the First District, returned from his vacation on August 25 on board the North German Lloyd liner Kaiser Wilhelm II.

CLAUDE L. MATTHEWS, of W. N. Matthews & Brother, St. Louis, Mo., who was appointed as delegate to the National Irrigation Congress by the governor of Missouri, has returned from his trip to the Coast.

B. E. EDWARDS has resigned as president of the La Crosse City Railway Company, of La Crosse, Wis. Mr. Edwards was one of the original incorporators of the company and has held his office for almost thirty years. C.

HENRY C. PAGE, for four years general manager of the Springfield (Mass.) Street Railway, was transferred September 1 to the management of the lines in and around Worcester, Mass., controlled by the New England Investment and Security Company. He takes the place of E. G. Connette, who becomes the transportation engineer under the New York Public Service Commission, and is succeeded at Springfield by E. J. Dickson.

FRANK H. HILL, who has long been identified with the sales and engineering department of the New York office of the Sprague Electric Company, assumed the duties of manager of the branch office in Atlanta, Ga., on September 1, in place of F. V. L. Smith, who has resigned. Mr. Hill is a native of New York state and his natural energy, together with his experience in the various departments of the Sprague company, gives him special fitness for his new duties in the South, where his abilities will have greater opportunity.

THEODORE INSLEE JONES, manager of the sales department of the United Electric Light and Power Company, New York city, has resigned his position to take up the duties of general agent of the Edison Electrical Illuminating Company of Brooklyn. The change will take place September 15, 1909. Mr. Jones, who is a graduate of the Massachusetts Institute of Technology, was formerly connected with the American Telephone and Telegraph Company, and subsequently as illuminating engineer with the Nernst Lamp Company.

WILLIAM D. RAY has resigned the position of contract agent of the sanitary district of Chicago, and on September 1 took up new duties as general manager of the Northern Indiana Gas and Electric Company. Mr. Ray is well known to electrical men, having had wide experience in various branches of the industry. During the time from 1894 to 1897, while general manager of the Everett (Wash.) Railway and Lighting Company, Mr. Ray enjoyed the distinction of being the youngest manager of electric railway and lighting properties in the United States. Since then he has successfully managed various electrical properties, has directed the electrical department of several large steam roads and has also been the electrical engineer in the construction of several large electric railways now in operation. He was active in the pioneer electric lighting days in Chicago and later was connected with the electrical department of the Chicago World's Fair. He is the inventor of a number of electrical devices now in commercial use and is the patentee of an electric arc lamp. Among his technical writings is a popular book entitled "The Practical Application of Dynamo-Electric Machinery." As contract agent of the sanitary district, Mr. Ray accomplished the successful launching of its municipal lighting and industrial power project, and has placed the sale of its current on a profitable, and in every way successful, basis. He leaves the district with the confidence and good will of the trustees and all his associates. As manager of the Northern Indiana Gas and Electric Company, Mr. Ray will have headquarters at Hammond and will direct the affairs of the company at Hammond, Michigan City, Whiting, East Chicago and Indiana Harbor. Mr. Ray entered the American Institute of Electrical Engineers as an associate in 1892 and served a term as vice-president of the Chicago Electrical Association. He is thirty-eight years old, married and has two daughters. By reason of his integrity and pleasing personality, he enjoys the esteem and high regard of a large circle of friends, all of whom will be pleased to know that with his new connection he also acquires a stock interest in the prosperous Indiana company.

OBITUARY.

J. B. STETSON, president of the California Street Cable Railroad Company, died on August 21 at his home in San Francisco. He was prominent in commercial and railroad circles, organizer of the company which constructed the San Joaquin Valley Railroad, and the leading spirit in the California Traffic Association, which brought about a seventy-five per cent reduction in transcontinental freight rates.

HUGH ERAT HARRISON, principal of the Electrical Standardizing, Testing and Training Institution, Faraday House, London, England, died in London on August 12 last at the age of fifty years. Mr. Harrison has long been a familiar figure in the electrical world of Great Britain and his loss will be keenly felt. He will be remembered in this country as one of the delegates sent by the (London) Institution of Electrical Engineers (of which he was a member) to the International Electrical Congress at St. Louis in 1904. Mr. Harrison has contributed to electrical literature, and besides having written many articles for the electrical press of England was the author of several textbooks. He has twice been elected a member of the Council of the Institution of Electrical Engineers, was an honors *B. Sc.* of London University, a fellow of the Physical and Chemical Societies of London, and an associate member of the Institution of Civil Engineers.

NEW PUBLICATIONS.

DICTIONARY OF CHEMICAL AND METALLURGICAL MATERIAL—The first edition, dated 1909, of this handy little publication has been issued by "Electrochemical and Metallurgical Industry," 239 West Thirty-ninth Street, New York. The work is divided into three parts: (1) Machinery, Appliances and Material for Chemical and Metallurgical Industries (pages 1 to 132). (2) Measuring Instruments and Laboratory Supplies (pages 133 to 176). (3) Professional Directory (pages 177 to 182). When advisable a definition of an entry is given, and in all cases the firm or firms supplying the article; sometimes also a description of the article itself. The whole is alphabetically arranged under the three heads as above. The new work fills up a gap in chemical and metallurgical literature and will be found convenient, handy, and useful for reference purposes.

BULLETIN OF THE INTERNATIONAL UNION OF THE AMERICAN REPUBLICS—The July issue, which has recently appeared, is the "Annual Review" number of this publication, and contains a very carefully-prepared summarized statement of commercial, material, business and economic conditions in the twenty Latin-American Republics, from Cuba and Mexico south to Argentina and Chile. A careful perusal not only of the general introduction but of the data under each country will disclose interesting and instructive facts concerning the progress and development of these countries, which are attracting more than ever the attention of the world because of their immense material possibilities. This issue is a little delayed in delivery because the forms were held open up to the last moment, in order to receive the latest statistical reports from the different countries, some of which only arrived at the office of the International Bureau in the very last days of July.

NEW PROPOSALS.

COURT HOUSE AND CUSTOM HOUSE, RICHMOND, VA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., September 20, 1909, for the reconstruction of the U. S. Post Office, Court House and Custom House at Richmond, Va., in accordance with the drawings and specifications, copies of which may be obtained from the custodian at Richmond, Va., or at the Supervising Architect's office.

POST OFFICE, LANCASTER, OHIO—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m. on October 6, 1909, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Lancaster, Ohio, in accordance with drawings and specification, copies of which may be obtained from the custodian of site at Lancaster, Ohio, or at the Supervising Architect's office.

POST OFFICE, DENISON, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., October 1, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Denison, Tex., in accordance with the drawings and specification, copies of which may be obtained from the custodian of site at Denison, Tex., or at the Supervising Architect's office.

POST OFFICE, WOONSOCKET, R. I.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., September 28, for the construction (including plumbing, gas piping, heating apparatus,

electric conduits and wiring) of the U. S. Post Office at Woonsocket, R. I., in accordance with the drawings and specification, copies of which may be obtained from the custodian of site at Woonsocket, R. I., or at the Supervising Architect's office.

POST OFFICE, FREDERICKSBURG, VA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., October 4, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Fredericksburg, Va., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Fredericksburg, Va., or at the Supervising Architect's office.

POST OFFICE, GREAT FALLS, MONTANA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., September 29, for the construction (including plumbing, gas piping, heating and ventilating apparatus, electric conduits and wiring, and standard clock system) of the U. S. Post Office and Court House at Great Falls, Mont., in accordance with the drawings and specification, copies of which may be had from the custodian of site at Great Falls, Mont., or at the Supervising Architect's office.

POST OFFICE AND COURT HOUSE, SAN ANGELO, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., September 16, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring and standard clock system) of the United States Post Office and Court House at San Angelo, Tex., in accordance with the drawings and specification, copies of which may be obtained from the custodian of site at San Angelo, Tex., or at the Supervising Architect's office.

INDUSTRIAL ITEMS.

THE PHILADELPHIA STORAGE BATTERY COMPANY has just moved into its new factory at Ontario and "C" streets, Philadelphia, Pa. A much larger floor space will enable the company to handle its rapidly increasing business with facility.

THE INDIANA RUBBER AND INSULATED WIRE COMPANY, of Jonesboro, Ind., is increasing its factory facilities by an addition to its plant, which will have a floor space of 10,000 square feet. This will give a total floor space of 100,000 square feet to the establishment.

THE SOUTHERN ILLINOIS ELECTRIC COMPANY, East St. Louis, Ill., dealer in electric lighting, railway and mine supplies, announces that it will soon issue a new and complete catalogue. This company is doing a constantly increasing business and is rapidly forging to the front.

THE KEUFFEL & ESSER COMPANY, Hoboken, N. J., is publishing a new leaflet concerning the blueprint papers that it deals with. They are of various widths and weight of paper and come in rolls of ten or fifty yards. The company also deals in Columbia blueprint cloth of both light and medium weight.

THE BENJAMIN MANUFACTURING COMPANY, in writing to its patrons and friends that its Chicago address has been changed in accordance with the new numbering system to 507 West Jackson Boulevard, has sent out a map of the city of Chicago showing in a very clear manner the general arrangement of the new numbers throughout the city.

THE PITTSBURGH TRANSFORMER COMPANY, Pittsburgh, Pa., is sending out a folder which calls attention to the large business on its transformers and the resulting advantages therefrom. Incidentally it has enclosed in this folder a very attractive calendar card for the month of September. Its patrons who are admirers of feminine beauty will be interested to receive this.

B. F. WASSON, president of the Wasson Reel Company, Clinton, Ill., has just returned from Winnipeg, Manitoba, where he established a factory for manufacturing the Wasson reel in the Dominion of Canada. The Wasson reel has met with great favor among electric light and telephone companies and other users of wire in the United States, and it is safe to say that it will become equally as popular in Canada.

THE HOYT ELECTRICAL INSTRUMENT WORKS, of Penacook, N. H., has bought a piece of land fronting 100 feet on Main Street, which forms a part of the Central Trunk Boulevard, being built through the White Mountains. Upon this plot the company will erect a modern fireproof garage and salesroom. The great demand for Hoyt meters has made it necessary to devote its entire Washington Street plant to their manufacture.

W. N. MATTHEWS & BROTHER, 219 North Second Street, St. Louis, Mo., have published a valuable book containing a reprint of an article on "Heavy Wire Terminations," by Anthony Gorham, which appeared in one of the electrical papers. This article describes very appropriately the adaptability of the well-known Matthews cable clamps. There are also given a number of good illustrations and many facts relating to the use of Matthews guy anchors, lamp guards, cable-splicing joints, lamp changers, etc. The book is concluded with a large number of valuable wire tables, tables of weights and measures, and a considerable amount of other data that are frequently referred to.

THE WESTERN POWER PLANT EQUIPMENT COMPANY, Chicago, Ill., as western representative of the Enterprise Machine Manufacturing Company, Pittsburg, Pa., is distributing Bulletin 100 on the Enterprise multiple strainer, and Bulletin 101 on Enterprise tube cleaners, both manufactured by the Enterprise company.

THE MOORE ELECTRICAL COMPANY, Newark, N. J., has issued an interesting booklet, entitled "Great Electricians," containing halftone illustrations of leaders in electrical science and application from Gilbert (A. D. 1600) to the present day. A short article on "Electricity, the Last of the Sciences," is prefixed, by W. Wirt Mills.

THE MASSACHUSETTS CHEMICAL COMPANY, Walpole, Mass., has prepared the second edition of its catalogue of liquid, plastic and solid insulating tapes and fabrics, as well as molded rubber goods. Most of these products are of interest to electrical men. The particular characteristics and advantages of each of these insulating materials are clearly stated. Copies of this catalogue are to be obtained upon application to the company.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing a new booklet descriptive of its new Universal electric flatirons. These irons employ a new type of heating element for which a high efficiency is claimed. Special attention has been given in this new design to securing a uniform heat distribution on the ironing surface and yet maintain a very low temperature at the top of the iron. These circulars will be sent upon request.

THE H. W. JOHNS-MANVILLE COMPANY, New York, N. Y., has issued an attractive little book (catalogue 303) on J-M asbestos roofing. Other products listed here are J-M point-tite tinners' and slaters' roof cement, J-M Ajax asphalt cement, J-M Ajax asbestos waterproofing, "asbestoside" (an asbestos wall siding for factory plants, warehouses, barns, etc.), J-M Regal roofing, price lists, etc. A partial list is given of representative firms using J-M asbestos roofing.

THE OHIO BRASS COMPANY, Mansfield, Ohio, has published the August number of its "O-B Bulletin" of electric-railway and mine-haulage material. This contains, among other things, the articles: "Bonding Special Work," by W. H. Williams; "An Interesting Catenary Installation," by Clark T. Anderson; The Chicago Subway; an illustrated sketch, "Plant of the Ohio Brass Company;" Want advertisements, etc. Illustrated descriptions of some O-B trolley-wire hangers, etc., are also given.

THE YALE & TOWNE MANUFACTURING COMPANY'S shop courses have been referred to in a recent newspaper item as follows: "A student of Sibley College, Cornell University, inquiring as to how much credit he would obtain for shop work done during the vacation, was told that it was the practice to give one hour's credit for every two hours devoted to actual work in a shop or foundry, provided the latter were approved by the faculty as a proper place for gaining useful experience. Asking if the Yale & Towne works at Stamford, Conn., would fit this description, he was informed that double credit would be given for any time spent in this plant, as, in the opinion of the faculty, it was the full equivalent of the instruction given at the college, and that in this respect it ranked with a very few of the leading industries of the United States."

DATES AHEAD.

Northwest Electric Light and Power Association. Annual convention and joint session with Seattle branch, A. I. E. E., Seattle, September 7-9.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-10.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 14-16.

Kansas Gas, Water, Electric Light and Street Railway Association. Next meeting, Wichita, Kan., September 23-24.

Illuminating Engineering Society. Annual convention, New York, N. Y., September 27, 28 and 29.

American Street and Interurban Railway Association. Annual convention, Denver, Colo., October 4-9.

Colorado Electric Light, Power and Railway Association. Annual convention, Denver, Colo., October 7, 8 and 9.

Railway Signal Association. Annual meeting, Louisville, Ky., October 12-14.

Western Association of Electrical Inspectors. Annual meeting, Detroit, Mich., October 26, 27 and 28.

American Association of Electric Motor Manufacturers. Next meeting, St. Louis, Mo., November 15 and 18.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) August 24, 1909.

931,721. PLURAL LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company. Filed October 17, 1904. The separate sockets are disposed in a hemispherical shell.

931,722. CLUSTER LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company. Filed July 18, 1907. The housing for the socket is detachably connected to a supporting member.

931,743. ELECTRIC ENGINE. William Farrell, Philadelpria, Pa. Filed August 3, 1908. A motor mounted with a revoluble body has secured to it a gear wheel which engages with a circular stationary track. Power is transmitted from the revoluble body.

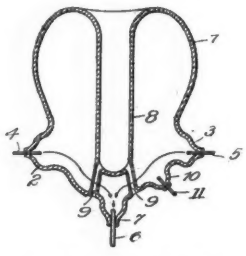
931,771. HANGER FOR TROLLEY-WIRES. Charles A. Kraynik, Racine, Wis. Filed July 10, 1908. Comprises a flat non-conducting body having an arched lower end, a conducting plug extending through the body and beyond opposite faces thereof, non-alining brackets secured to opposite faces of the body and at opposite sides of the arch, contacts pivotally mounted within the brackets, etc.

931,775. SMELTING-FURNACE. Story B. Ladd, Washington, D. C. Filed June 7, 1907. A furnace for pyritic smelting comprises an elongated hearth adapted to retain a molten bath of matte, twyers disposed above the normal level of the bath, means for passing an electric current through the bath to maintain the temperature thereof, and means for effecting a continuous withdrawal of molten material from the bath.

931,806. RECTIFIER. Charles W. Sirch, Los Angeles, Cal. Filed November 2, 1907. Electrodes project from the walls of an inclosing glass bulb, and a chamber to permit a current of air to pass through to cool the electrodes extends through the interior of the bulb.

931,807. INCANDESCENT LAMP. Edward H. Smith, Aberdeen, Wash., assignor of two-thirds to Thomas Mitchell, Aberdeen, Wash. Filed August 21, 1908. Comprises a plug having a flange with an indented bridging portion forming a contact, a bulb, a head therefor rotatably mounted in the plug, spaced apart contacts carried by the head, and means for limiting the movement of the head relative to the plug.

931,835. ELEVATOR SIGNAL SYSTEM. James F. Baker and Arthur C. Moore, Kansas City, Mo. Filed October 22, 1907. Electric signaling devices, each connected with its separate contact part on a common switchboard, are provided at the several floors and are operated independently by the elevator operating mechanism.



931,806.—RECTIFIER.

931,854. RELAY MECHANISM. Samuel B. Fowler, La Fayette, Ind. Filed June 5, 1907. Two parallel electromagnets are devised so that attraction of one armature will cause the other armature to be bodily carried thereby.

931,904. TELEPHONE SYSTEM. Harry G. Webster, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. Filed July 27, 1906. A traveling switch for the line is operated by a motor magnet and a source of current, and a cut-off relay operates when energized to interrupt the normal circuit of the line limbs and of the line relay.

931,905. TELEPHONE SYSTEM. Harry G. Webster, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. Filed July 27, 1906. The insertion of a plug into the spring jack causes a movement of the switch to remove the normal battery connections of the line limbs.

931,906. TELEPHONE SYSTEM. Harry G. Webster, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. Filed August 13, 1906. A traveling switch having moving contacts is used to establish connection between a calling line and an idle link circuit, and means are provided for preventing electrical variations in the local circuit from producing disturbing currents in the line.

931,911. CONTACT DEVICE FOR SWITCHES. John A. York, Hartford, Conn., assignor, by mesne assignments, to The Arrow Electric Company. Filed May 18, 1908. A spring plate has two supports projecting from it at right angles, a pole plate with outwardly extending brush ends has an an elongated opening skewed at an angle of forty-five degrees to the pole-plate axis, and suitable insulation is provided on the supports and in the slot.

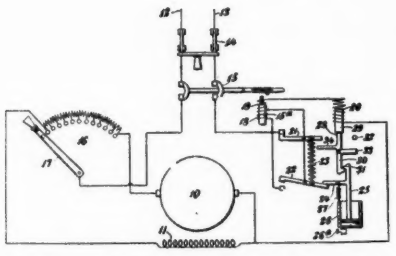
931,929. SECONDARY BATTERY. Henry F. Joel, Forest Gate, England. Filed April 13, 1908. The cylindrical negative electrode is spaced from the surrounding positive hollow cylindrical electrode by a separator having free vertical channels communicating with the electrolyte above and below the electrodes.

931,944. PROCESS FOR ELECTROLYTIC DEPOSITION OF METALS. Frank C. Mathers, Bloomington, Ind. Filed April 21, 1909. Consists in subjecting the metal or an alloy of the metal as anode to an electric current in a solution containing a salt of perchloric acid and in electrodepositing the metal upon the cathode.

931,947. RECHARGEABLE AND NON-INTERCHANGEABLE INCLOSED THERMAL CUT-OUT. Thomas A. Miller, South Hingham, Mass. Filed June 13, 1908. The fuse is inclosed in a case having removable sides, and separate fastenings co-operate with the fuse and the sides to maintain the latter in position to close the case.

931,994. TIME-LIMIT DEVICE FOR CONTROLLERS. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed September 29, 1906. An electromagnetic circuit-breaker has means for rendering inoperative a portion of the actuating coil thereof for a predetermined time after the circuit is closed.

932,003. MEANS FOR PROTECTING OPERATORS' RINGING LEADS FROM SHORT-CIRCUITS. William W. Dean, Elyria, Ohio, assignor to the Dean Electric Company. Filed August 9, 1905. In combination with a line circuit, a source of ringing current, and a switch for connecting the source to the line, is a relay having its circuit completed and its operation continuously controlled through a back contact of its own armature, interposed in the circuit between the source and the switch.



931,994.—TIME-LIMIT DEVICE FOR CONTROLLERS.

932,013. ELECTRIC TRANSFORMER-FURNACE. Otto Frick, Stockholm, Sweden. Filed December 26, 1906. An electric induction furnace comprises a masonry base with an annular hearth for the material to be treated forming the secondary circuit of the furnace, a primary winding facing more than one side of the hearth, and a closed magnetic core, one limb of which is surrounded by the hearth and by the primary winding, and the other limbs of which are at such distance from the winding that a free space is left between the iron and the winding.

932,018. STEP-OPERATED CIRCUIT-BREAKER FOR ELECTRIC CARS. Benjamin B. Herron, Toledo, Ohio. Filed May 3, 1909. Describes a device for preventing the premature starting of an electric car.

932,019. TELEGRAPH-KEY. John A. Hulit, Topeka, Kan., assignor to J. A. Rosen, Topeka, Kan. Filed March 26, 1908. The device described comprises a telegraph key, a switch associated therewith, a clamp for securing the key, and

switch to the typewriter frame adjacent to the typewriter keyboard, and a flexible cord for electrically connecting the key and switch with the telegraph circuit.

932,030. ELECTRICALLY-DRIVEN ELEVATING MECHANISM FOR BARREL-RECOIL GUNS. Johannes Krone, Essen-on-the-Ruhr, Gustav A. Schoeller, Mülheim-on-the-Ruhr, and Hermann Sundhaussen, Bredeney, Germany, assignors to Fried Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Filed May 6, 1908. An electric motor moves the gun barrel between loading and firing positions; one of the controlling circuits for the motor is provided with means adapting it to be closed by the recoil movement of the gun barrel and another by the closure of the breech; and means operated by the gun barrel when it reaches firing position are provided for breaking the motor circuit.

932,031. ELECTRICALLY-DRIVEN ELEVATING MECHANISM FOR GUNS. Johannes Krone, Essen-on-the-Ruhr, Gustav A. Schoeller, Mülheim-on-the-Ruhr, and Hermann Sundhaussen, Bredeney, Germany, assignors to Fried Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Filed May 12, 1908. An electric motor drives the mechanism for elevating and depressing the gun; a resistance is provided normally in circuit with the electric motor when the gun is approaching the firing position whereby the speed of the motor is reduced; and means are provided for automatically short-circuiting this resistance to cause the gun to travel faster during other portions of its travel.

932,042. SUPPORT FOR COMMUTATOR-LEADS. Emil Mattman, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed January 31, 1907. The armature of a dynamo-electric machine comprises a laminated core, end-heads at the ends of the core (one of these end-heads having an annular bracket), a winding on the core, a commutator, and commutator necks connecting the winding and commutator and having shoulders which bear against the inside of the bracket.

932,056. ELECTRIC SNAP-SWITCH MECHANISM. Charles G. Perkins, Hartford, Conn., assignor to the Arrow Electric Company. Filed October 25, 1907. Comprises an operating spindle, a pole plate rotarily movable about the spindle, mechanism for locking and releasing the pole plate, and a pair of studs, with two contact plates mounted on them, projecting from the pole plate. These contact plates have a central opening and stud perforations arranged diagonally with relation to their axes.

932,069. ELECTRIC FURNACE. Frank J. Tone, Niagara Falls, N. Y. Filed December 12, 1907. Has an arc reduction zone, a receiving space below this zone for the collection of the molten products and a hearth located between the reduction zone and the receiving space. The hearth supports and is substantially impervious to the charge but pervious to the molten products of reduction, and the arc has as a lower electrode a resistance column which is adapted to heat the reduced products after they leave the reduction zone.

932,072. SYSTEM OF DISTRIBUTION. Hermon L. Van Valkenburg, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed August 31, 1906. A switch or circuit-breaker is arranged to be tripped by a magnet coil having a circuit in shunt to it, and means are provided for opening and closing this circuit in a manner responsive to the direction in which energy is transmitted through the switch or circuit-breaker.

932,080. CYLINDRICAL INSULATION. Homer A. Woods, Indianapolis, Ind. Filed July 5, 1907. The process of manufacturing insulating cylinders consists in reducing a materjal which is a poor conductor of heat to a soft, pliable, pulpy condition, then subjecting a uniform layer of that material to heat with pressure to form a flat board of uniform density, then separating the board by cuts diagonally of its sides, into staves, and then bending the staves to a cylindrical shape to vary the density of the stave from inner maximum to outer minimum.

932,083. TURBO-ROTOR. Alfred H. Wouters, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company, jointly. Filed February 28, 1907. The rotor of a dynamo-electric machine comprises a core, coils carried by the core, and projecting beyond the end thereof, an annular coil retaining member surrounding the projecting portions of the coils, means for holding these portions of the coils to engagement with the annular member, which means being electrically connected to the coils and serving to carry current to and from the same.

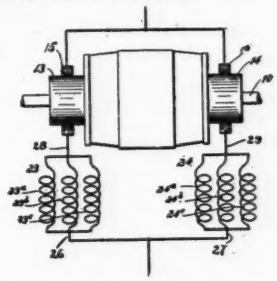
932,084. DYNAMO-ELECTRIC MACHINE WITH DISTRIBUTED BALANCING-WINDING. Edwin C. Wright, Newport, Ky., assignor to the Bullock Electric Manufacturing Company. Filed January 22, 1906. A double commutator dynamo-electric machine comprises a main field winding, means for reducing the tendency of unequal distribution of current between the two commutators, comprising sets of distributed auxiliary field windings, each set consisting of a number of windings in parallel with one another and connected to the brushes of one of the commutators.

932,087. GAS-CONTROLLING APPARATUS FOR BATTERY-CELLS. Oscar D. Apple, Miamisburg, Ohio. Filed February 13, 1908. A battery of cells has a fluid-containing reservoir common to all of the cells, and vent pipes independently connect the various cells with the reservoir, each pipe leading from a point above the level of the fluid in the corresponding cell to a point below the fluid level of the reservoir.

932,097. ROTOR CONSTRUCTION. Bernard A. Behrend, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed December 1, 1905. The rotor comprises a shaft, a core having a number of rigid circular disks of definite thickness located on the shaft (these disks having radial slots and wedge-shaped pole pieces), and a coil of edgewise wound strap copper surrounding each of the wedge-shaped pole pieces.

932,105. MORSE TELEGRAPHIC APPARATUS. Giovanni Bogni, Sesto Calende, Italy. Filed August 28, 1905. Describes a form of transmitter.

932,111. PRODUCING HIGH-FREQUENCY OSCILLATIONS. Reginald A. Fessenden, Washington, D. C. Filed December 14, 1905. A capacity changer for electromagnetic electric circuits comprises a condenser and means to rapidly move its effective co-operating members relative to each other, to produce oscillations in the circuit.



932,084.—DYNAMO-ELECTRIC MACHINE WITH DISTRIBUTED BALANCING-WINDING.

932,112. LIGHTNING-ARRESTER. Reginald A. Fessenden, Brant Rock, Mass. Filed May 9, 1908. A lightning arrester comprises a rapidly self-restoring compressed air discharge gap and a circuit around the gap containing a capacity and inductive resistances on each side of the capacity, adjusted to absorb energy of discharge from the capacity, and make the circuit non-oscillatory.

932,114. CAR-LIGHTING SYSTEM. Edward C. Folsom, Saginaw, Mich. Filed April 16, 1908. An electrically propelled vehicle has a headlight at each end, a cylinder for reversing the direction of the current, and separate headlight circuits controlled by the movement of the reverse cylinder to forward or backward position to light the front or back headlight respectively.

932,132. AUTOMATIC SWITCHBOARD. Alexander Jambor and Paul Jambor, Bathbeach, N. Y. Filed March 31, 1909. Has fixed and movable contact pieces and means for setting the latter in position on the switchboard.

932,139. LAMP-SOCKET. Willard H. Kempton, Hartford, Conn., assignor to the Johns-Pratt Company. Filed February 13, 1909. A recessed body of insulating material has a conducting shell located therein and is closed at its upper end. A spring is provided to force a loosely connected conductor (connected with a central contact) against a conductor connected with the shell.

932,161. APPARATUS FOR GENERATING GASES BY ELECTRIC DISCHARGES IN AIR. John E. Mitchell, St. Louis, Mo. Filed May 14, 1909. Comprises two rotatable electrodes forming the terminals of an electric circuit and having circular contacting surfaces (one of the electrodes being mutilated), means for rotating the mutilated electrode, whereby the circuit will be alternately closed and opened with the intermediate production of arcs, and means for delivering a blast of air in proximity to the electrodes.

932,196. ELECTRIC-INSTALLATION OUTLET BOX. Wheeler H. Vibber. New London, Conn., assignor of one-half to the Gillette-Vibber Company. Filed January 22, 1909. Has an anchor for bodily insertion through an opening in the plaster smaller in size than the flatwise area of the anchor, a box inserted into the opening after the anchor has been posi-

tioned back of the plaster, and screws passing through the box into the anchor for holding the box in place.

932,208. INSULATED SWITCH-BAR FOR RAILROADS. George W. Whiteman, Philadelphia, and Charles W. Reinoehl, Steelton, Pa. Filed February 29, 1908. Overlapped sections are bolted together through a separator of insulating material.

932,239. ELECTRICAL IGNITION FOR INTERNAL-COMBUSTION ENGINES. Victor Barreto, Marlow, England. Filed May 11, 1908. A rotary high-tension distributor comprises a box or casing of conducting material having in its circumference one or more stationary pole pieces or terminals insulated from the box, each forming the pole of an igniting circuit, a movable sparking gap arm connected with a high-tension circuit and adapted to turn on the axis of the box, so as to face the stationary pole or poles and thereby to lead high-tension current to the same once at every revolution, and a grounding device connected with the box.

932,242. ELECTRICAL PRODUCTION OF HEAT FOR COOKING AND OTHER PURPOSES. Arthur F. Berry, Ealing, England. Filed August 9, 1906. Electrical heating apparatus comprises a magnetic core having a closed magnetic circuit, and primary and secondary conductors arranged in close proximity to each other throughout their length and to surround a part of the core, the secondary conductor being permanently closed on itself and arranged to be exposed throughout its length to the body to be heated.

932,246. INCANDESCENT-LAMP SOCKET AND SWITCH. Ira L. Cash, Portland, Ore. Filed February 15, 1908. Comprises a shell having a slot, a block within the shell, a conductor plate within the block, a stem passing down into the block from above, a switch lever pivoted to the stem and projecting through the slot, contact plates within the block spaced apart from each other, and means adjustable transversely of the lever for moving between the plates to place them in electrical connection with each other when the lever is swung.

932,273. ELECTRICALLY LIGHTING UP GAS-LAMPS. Albert E. Hacking, West Bridgeford, Nottingham, England. Filed May 20, 1907. Describes a device having one fixed and one movable carbon electrode, for electrically lighting incandescent gas lights.

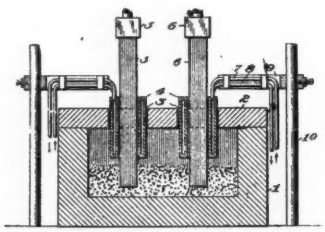
932,296. ELECTRIC FURNACE. Gilbert C. Landis, York, Pa., assignor to American Phosphorus Company. Filed April 8, 1907. Has a conducting lining in which is formed a working chamber, with a carbon terminal extending under the working chamber and laterally through the walls of the furnace and embedded in the conducting lining.

932,312. MOTOR VEHICLE. Lars G. Nilson, Philadelphia, Pa., assignor to William B. Strang, New York, N. Y. Filed February 23, 1906. In combination with an engine is a dynamo driven thereby, also a working circuit supplied by the dynamo, and an auxiliary circuit including a source of supply and a motor for starting the engine.

932,323. TELEPHONE MOUTHPIECE. George H. Reed, New York, N. Y. Filed January 16, 1909. Has a disinfecting device connected therein.

932,332. IGNITER. George W. Sage, Eureka, Cal. Filed October 6, 1908. Describes a contact and release igniter.

932,338. SPARK PLUG. William M. Sleaford, Brighton, Mich. Filed November 16, 1907. Has one fixed and one movable terminal.



932,368.—ELECTRIC FURNACE.

932,363. TROLLEY WHEEL. Frederick S. Yoder, Wernersville, Pa., assignor of one-half to Kenzie N. Yoder, Reading, Pa. Filed September 30, 1908. A rotatable electric conductor comprises a metallic trolley wheel having two integral annular flanges, a body having three annular surfaces, the central surface forming a groove and being of smaller diameter than the side surfaces.

932,368. ELECTRIC FURNACE. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company. Original application filed January 8, 1908. Divided and this application filed June 6, 1908. Comprises a working chamber, metallic electrodes of opposite polarity extending into the same, and cooling jackets applied to the electrodes and longitudinally adjustable thereon.

932,401. INCLOSED PANEL. Hubert Krantz, Brooklyn, N. Y. Filed April 4, 1906. An inclosed chamber has a perforate fixed cover, an outer cover is arranged normally to conceal the perforate cover, this outer cover being provided with apertures in registry with those in the perforate cover and a switch within the chamber.

932,405. DOUBLE-FILAMENT INCANDESCENT LAMP. Henry E. Meyers, Denver, Colo., assignor of one-fourth to Gustav Schrage and one-fourth to W. E. Tallmadge, Sheboygan, Wis. Filed March 31, 1906. The globe has a tubular neck and a hollow body portion projecting from one end of and communicating with the tubular neck, and provided at its opposite end with a longitudinally extending chamber, and with a cylindrical hollow portion arranged within this chamber and communicating with the hollow body portion at one end and closed at its opposite end.

932,406. AUTOMATIC FLASH LAMP. Henry E. Meyers, Denver, Colo., assignor of one-fourth to Gustav Schrage and one-fourth to W. E. Tallmadge, Sheboygan, Wis. Filed April 30, 1906. In combination with an incandescent lamp is a thermostat having a spring-plate portion to spring outward as the thermostat becomes heated and inward as it cools respectively.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 30, 1909:

481,560. SECONDARY BATTERY. William W. Griscom, Haverford College, Philadelphia, Pa.

481,590. AUXILIARY FIRE-ALARM SYSTEM. Joseph Sachs, New York, N. Y.

481,617. LIGHTNING-ARRESTER CUT-OUT. James P. Freeman, Washington, D. C.

481,664. GALVANIC BATTERY. William H. Engledue, Byfleet, England.

481,665. SAFETY ATTACHMENT FOR ELECTRIC CONDUCTORS. Rudolph Furgang, Boston, Mass.

481,666. SAFETY ATTACHMENT FOR ELECTRIC CONDUCTING-WIRES. Rudolph Furgang, Boston, Mass.

481,677. DUPLEX ARC LAMP. Charles E. Scribner, Chicago, Ill.

481,678. MULTIPLE SWITCHBOARD TELEPHONE-EXCHANGE SYSTEM. Charles E. Scribner, Chicago, Ill.

481,679. TELEPHONE EXCHANGE. Charles E. Scribner, Chicago, Ill.

481,692. ELECTRIC CIGAR-LIGHTING LAMP. William J. Eastman, Waterville, N. Y.

481,701. ELECTRIC MOTOR OR DYNAMO-ELECTRIC MACHINE. Robert Lundell, Brooklyn, N. Y.

481,726. ELECTRICALLY-CONTROLLED STOP-MOTION FOR KNITTING MACHINES. Veeder S. Clute, Cohoes, N. Y.

481,739. ELECTRIC MOTOR AND REGULATING DEVICE THEREFOR. Frank J. Sprague, New York, N. Y.

481,781. RHEOSTAT. Charles E. Carpenter, Minneapolis, Minn.

481,785. ELECTRIC LIGHTING SYSTEM. Pitt Cravath, Whitewater, Wis.

481,833. DEVICE FOR REMOVING ARMATURES. Stephen H. Sharpsteen, Honesdale, Pa.

481,847. FIRE-ALARM TELEGRAPH. Andrew J. Coffee, Portland, Ore.

481,878. SYSTEM OF TELEPHONY. Elihu Thomson, Swampscott, Mass.

481,904. SYSTEM OF ELECTRIC LIGHTING. Ernest Huber, New York, N. Y.

481,905. ELECTRIC RAILWAY. Rudolph M. Hunter, Philadelphia, Pa.

481,912. CONDUIT FOR ELECTRIC CONDUCTORS. Augustus Noll, Mount Vernon, N. Y.

481,913. CONDUIT FOR ELECTRIC CONDUCTORS. Augustus Noll, Mount Vernon, N. Y.

481,914. ELECTRIC CIRCUIT CONNECTION. Augustus Noll, Mount Vernon, N. Y.

481,916. ELECTRIC CENTRAL CLOCK. Nicolaus Prokhoroff, Kiev, Russia.

481,919. ELECTRIC GUEST-CALL. Franklin Benner, Minneapolis, Minn.